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The MONTHLY REVIEW

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OF THE
SCIENCE OF ELECTRO-PLATING

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WHICH BUFF FOR YOUR WORK?

YOUR GUESS IS AS GOOD AS OURS.

BUT why guess? Let's get down to cases—and use the buff that has already reduced costs on work like yours. You can put this problem up to us because we have so many kinds of buffs to choose from and have applied them to so many different kinds of buffing and finishing work. This proper selection of a buff means a lot of difference to you and your profits. The right buff will do one of five things:—Increase production, reduce buff costs, reduce labor costs, reduce plating costs, or improve the quality of your product. Sometimes it does all five! Hitting in the dark doesn't help anybody—so let's try to get the right answer the first time. Send us the description of your finishing work and we will give you facts.

HANSON-VAN WINKLE-MUNNING

HANSON-VAN WINKLE-MUNNING COMPANY, MATAWAN, N.J.

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The MONTHLY REVIEW

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AMERICAN ELECTRO-PLATERS' SOCIETY

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EDITORIAL

To keep the members of A. E. S. informed as to what is being done in the electroplating world the Abstract Section was created. The splendid response to the able work done by E. B. Sanigar and T. F. Slattery has proven that our members appreciate the opportunity of being informed regarding the progress made in this and other countries in the field of electroplating. All A. E. S. members do not have access to the numerous magazines and technical papers that contain articles describing some new process or giving the data obtained through new researches. We are pleased to render this service and will continue to do so as far as it is possible.

In accordance with this service we believe that our members will be interested in the information given in this issue. There is no subject more often discussed at the meetings of the A. E. S. than that of chromium plating. The reception of Dr. C. G. Fink's defense at the Toledo, Ohio, Convention was illustrative of the wish to know just where the electroplating industry stands in regard to the patent situation.

The claims of the Fink patent were sustained by Judge E. Thomas in the suit by the Chromium Corporation vs. The International Silver Co. The decision rendered was upheld by the Appellate Division, U. S. Federal Court, New York District.

The Chrysler Corporation, operating under the Ewing patent were sued for infringement of the Fink patents in the Federal Court in the Delaware District. This suit was suspended without prejudice. The Chrysler Corporation has recently applied for permission to take depositions in anticipation of the reopening of the case.

The General Motors Corporation refused to acknowledge the validity of Fink's patent and two of their divisions—The New Departure Company, Bristol, Conn., and The Bassick Company, Bridgeport, Conn., were made the defendants in a suit brought by The General Chromium Corporation. The trial was held during the first part of September, 1933, in the Federal Court

Extra copies of this issue and any subsequent issue of the Monthly Review may be had for fifty cents (50c) paid in advance. No copies will be sent without the remittance. Address The Editor.

at Hartford, Conn.,—Judge E. Thomas presiding. Due to the lack of time the final arguments were not made until March 15, 1934.

The Monthly Review has obtained a copy of the briefs presented by both the plaintiff and the defendants. They will be published in the Monthly Review without comment; neither will any discussion that the A. E. S. members or any other person submits be published. The Monthly Review merely wishes to continue its policy to keep the members of the A. E. S. informed in the subject they are interested—electrodeposition of metals. It is our wish to be the "Clearing House" for papers, processes, patents and whatever other matter relates to the clause in our Constitution which states as the object of the A. E. S. "the dissemination of knowledge relating to electrodeposition of metals.."

"Business Sessions at the Conventions"

By George Gehling, former President of the A. E. S.

As our convention is drawing near and we look back over the past few years and see the way our business meetings have been rushed through, the thought occurs "What is the best time during the convention to hold our business meetings?"

After hearing the reports of the Officers and Committees with their recommendations do we really give enough time to these matters so that the Society can keep in step with what the officers and committees plan we should do during the coming year by having a proper discussion of these recommendations at our business meetings and adopting and approving whatever action the convention deems best that the officers should follow for the coming year?

With the election of officers etc., at the last session enough time and thought cannot be given to the serious problems which the Society has to overcome during the coming year, so that the progress of our Society from year to year is not what it could be.

We did believe we had adopted a good plan when we had the reports of officers read and resolutions submitted on the first day of the convention then leave the discussion and any action on them until the last day of the convention, thus allowing all the delegates the interval to think over what was taken up at the first business meeting, and from a parliamentary or political point of view this would seem correct, but as our delegates and members are not politicians or legislators who can go to a committee meeting while the rest of their colleagues are in session discussing educational papers in which they are also interested, therefor our present system does not work out as we expected it would.

Our delegates, members and guests are all interested in Electro-Plating and they want to hear all the discussions and take part

in them and that's just what a convention is held for, but it is equally important that they also give this same kind of thought to the business of the Society which makes it possible for having these conventions and educational features.

From experience we find that after the educational papers have been read the delegates seem to think the convention is over with the exception of electing officers and choosing the place of the next convention, and most everyone is on the run making reservations for their trip home or elsewhere to complete their vacation, so this brings us back to the question "When would be the best and proper time to hold our business meetings during the convention?"

We have taken too much for granted, in believing it is only necessary to listen to the reading of these reports, receive them, and let it go at that, this attitude does not help the progress of any society, we have been very fortunate in having officers, in spite of the fact that not enough attention or action is taken on their reports, that do continue to work and make up constructive reports for our benefit.

It may be a good plan for the coming convention committee to provide time for a business session covering the four days from 8 A. M. to 11 A. M. each day, this could be arranged as one meeting and taking a recess each day at 11 A. M. to go ahead with the educational programme, under this plan it would not be necessary to repeat the order of business at each session, but this could be split up into the four sessions, thus really making it one convention business meeting.

DETROIT CONVENTION

The Detroit Convention Committee of the A. E. S. wants you to start thinking now about your attendance at the Convention and making your plans to conform.

The Convention will be held at the Statler Hotel in Detroit, on June 11, 12, 13 and 14, starting on Monday and running through Thursday. The most beautiful time of the year in Detroit, is early June.

The Educational Program is shaping up so that we believe it will be worth the time and expense to anyone. On the entertainment side, those of you who were here in 1929, know that you had a good time, and we are going to repeat. The ladies will be our especial care, and notwithstanding any impressions they may have gathered from the movies, we can assure anyone that comes, that she will be glad of it. In Detroit, the opportunity of seeing mammoth, interesting plants, and up-to-the-minute developments cannot be surpassed anywhere.

Full details will come later, but we want everyone to start planning now. Most of you, under the N. R. A., probably do not work the latter end of the week, and in case you do not want to take the train, that will give you a chance to get out the

old car, and make it easily by Monday morning. On the other end, you have Friday, Saturday and Sunday in which to drive back home.

The Master Electroplaters Institute will hold their meeting in Detroit, on the 9th and 10th of June, just preceding ours, and if you are also a member of that, you had better plan on taking your vacation starting the 2nd of June and running till the 18th. Most schools close early now, and that would give you time to attend both meetings, and still have a chance to slip up north in Michigan and see the playground of the country. There are state parks everywhere with camping sites, and hotels galore.

We want you to come and now is the time to start making arrangements.

HAROLD W. FAINT
APPOINTED TO
UDYLITE PROCESS CO. STAFF

The Udylite Process Company, with main offices in Detroit, Mich., is pleased to announce the appointment of Harold W. Faint to its sales engineering staff.

Mr. Faint, whose headquarters will be the Chicago office of the Company is by no means a stranger to the electroplating industry, coming as he does from a "plating" family. Before the days of modern generators, his grandfather used storage batteries in his plating business in London, England. His father's entire career has been devoted to electroplating having been foreman plater for Singer Sewing Machine Company for a number of years and later having the same position at Internat'l Motors Corp., Allentown, Pa.

Following Mr. Faint's graduation as chemist from Rutgers in 1917, he joined Uncle Sam's fighting forces as Lieutenant of Infantry. After the war, he was engaged for a brief period in the profession of teaching. This was followed by a connection with J. B. Ford Company as Chicago sales and service representative on metal cleaning compounds.

Mr. Faint left J. B. Ford to become associated with U. S. S. Lead Refinery, E. Chicago, Ind., as head of laboratories and research. He left this position to go with Crowe Name Plate & Mfg. Company, Chicago, as chemical engineer in charge of special metallurgical and finishing problems. From this latter position, Mr. Faint recently resigned to join the Udylite organization.

In securing the services of Mr. Faint, Udylite feels that it makes another move toward placing the best plating brains available at the service of Udylite customers.

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF CONNECTICUT

UNITED CHROMIUM, INCORPORATED, Plaintiff,

vs.

GENERAL MOTORS CORPORATION, THE NEW DEPARTURE MANUFACTURING COMPANY, THE BASSICK COMPANY,

Defendants.

In Equity No. 2284

In the U. S. District Court
Hartford, Conn.
Thursday, 15th March 1934
at 10 o'clock a. m.

ARGUMENTS ON FINAL HEARING

Before:

Hon. EDWIN S. THOMAS,
U. S. District Judge

Appearances:

Messrs. GIFFORD, SCULL & BURGESS (New York City) by **GEORGE F. SCULL, Esq.**
of Counsel for Plaintiff

Messrs. COOPER, KERR & DUNHAM (New York City) by **DRURY W. COOPER, Esq.,**

FRANK E. LIVERANCE, Esq., (Grand Rapids, Mich.)
of Counsel for General Motors Corp., and The New Departure Manufacturing Company.

Messrs. FISH, RICHARDSON & NEAVE (New York City) by **MERRELL E. CLARK, Esq.,**
HAROLD F. WATSON, Esq.,
of Counsel for the Bassick Company.

Opening Argument on Behalf of Defendants

Mr. Merrell E. Clark: May it please the Court, on Tuesday afternoon we received from plaintiff's counsel, without any warning, something that they are pleased to call a "rejoinder to defendants' reply brief." There was no provision for any such rejoinders. Of course, we filed none. They waited until the eve of the argument and then served upon us this plaintiff's rejoinder to defendants' reply brief. I think the principal effect of that instrument, when it is read, is merely to show that the plaintiff here is now very definitely on the defensive.

In my remarks to your Honor I will deal primarily with the issue of validity. Mr. Cooper will follow me, discussing primarily the issue of non-infringement, although there may be some overlap, and Mr. Cooper, with his much greater experience, may have something to add to what I may say upon the issue of validity.

At the start of this case I should like to emphasize the fact that the record here is absolutely different from the record in the *International* case. In that case it was made to appear that Fink was a Moses who led the art out of chaos and showed them how to do chromium plating. In that case the defendant virtually admitted that the alleged infringement was the very thing disclosed and claimed in the Fink patent.

In that case neither of these important and conclusive defenses, the Udy defense and the Manhattan defense, neither of them was before the Court, although they were both well known to the plaintiff and its associates at that time.

Here instead of it appearing that Fink showed the way to commercial chromium plating, we find that the General Motors Corporation from whom these defendants have learned the practice now complained of, had reduced that practice to commercial operation prior to the issuance of the Fink patent;

Republication of these Arguments or any part thereof from this Review prohibited.

that General Motors process was based upon Sargent and these defendants' processes which follow the General Motors process are also based upon Sargent. They employ Sargent in exactly the way that Sargent was employed, for example, by Udy in his early work with the Sargent formula, and as it was employed by Westinghouse in the practice which the Court of Appeals held was not the Fink invention.

Also it is shown in this record, which did not appear before, that the plaintiff itself was born under most squalid circumstances and as a part of the settlement of this Udy-Fink controversy, about which I shall say more in a moment.

We do not have to go very far in this record to find wherein it differs from the *International* record. Let us take, for example, the very first point referred to by Mr. Scull this morning, namely, the statement in the Fink patent that "substances which I find suitable as catalytic agents and which remain stable are acids and bases having a sulphate radical, acids and bases having a fluoride radical, acids and bases having a phosphate radical, and acids and bases which have a borate radical."

This Court and the Court of Appeals well understood what that statement was intended to mean. The Court of Appeals said that—

> "The catalyst must contain an acid radical, stable in the bath, among which are suggested acids and salts having a sulphate, fluoride, phosphate or borate radical. Apparently the art has in practice used only the first, and to it many of the claims are confined."

And then the Court of Appeals in passing upon the petition for rehearing in the *International* case said:

> "The proper interpretation of the term catalyst in each of the claims is to be found by reference to the specification"—

and they were referring to this part in the specification, and they said—

> "the prescribed catalyst is any acid or base containing a sulphate, fluoride, phosphate or borate radical."

In order to sustain this patent in the *International* case and prove that it would work with the various things which Fink said were catalysts, were in fact catalysts, Professor Stevenson testified as follows: (This is part of the *International* record as quoted in this record.)

> "This paragraph you have been referring to said, 'acid and salts which have a phosphate radical'. Do you know as a matter of fact whether a phosphate, acid or salt having a phosphate radical could be used as a substitute for sulphate in this process?"

That question is very clear to me, and I think it will be to your Honor.

> "Do you know as a matter of fact whether a phosphate acid or salt having a phosphate radical could be used as a substitute for sulphate in this process?"

And Professor Stevenson answered in the *International* case:

> "I have made experiments using chromic acid and using phosphate as the salt employing therefor the phosphate radical, and I have gotten acceptable chromium plating."

Can there be any question as to what Professor Stevenson meant when he testified in that way? Then he was asked with reference to the borate radical right after that in the *International* case:

> "How about the borate?
>
> A. "The same thing is true of the borate.
>
> Q. "You have gotten acceptable chromium plating with borate?"
>
> A. "Acceptable chromium plating."

And upon the basis of that, this Court and the Court of Appeals held that any of these catalysts which Fink referred to in his patent, could be used, one or another of them.

And what is the situation now before this Court. Professor Stevenson was asked:

> "Will you name to the Court any acid or any salt having a phosphate radical which you would regard as available as a catalytic agent where nothing else was employed for a catalytic agent in the chromium plating bath?"

A. "No, I can not do so. I said before that it could not be used alone to give commercial chromium plating."

He had testified in the *International* case definitely that he could, and now he admits that it could not be done.

He made the same admission in this record about borate and then he tried to wiggle out of it and his wiggle was this:—that if you use enough sulphate radical to produce 95 per cent. of the catalytic effect, and then add ten times as much borate radical as you used sulphate radical, then perhaps the extra 5 per cent. catalytic effect or 1/19 of that produced by the sulphate would be produced by the borate. He said the situation is just as with the Bassick Company, which used borate in its bath and got acceptable plating. That was the situation he had in mind. He said just as the Bassick Company had borate present in their bath and got acceptable plating.

And then when we turn to this same learned Professor's testimony about the Bassick Company operation, he said, and I am quoting from page 374:

"The catalytic effect of any boric acid which could have been present, was negligible."

And so I say, you Honor, that this patent is invalid on its face, and in view of these admissions of Stevenson, because it states definitely and unequivocally, as he testified definitely and unequivocally in the *International* case, that phosphate will act and can be used as a radical and obtain acceptable plating, and that borate can, and now they admit that neither of them will work in any reasonable or substantial sense of the word.

The cases, your Honor, are perfectly clear upon that point. At page 7 of our main brief we have cited the case of *Rickard vs. DuBon*, decided in this District and affirmed here, that under similar circumstances the patent was held void for lack of utility, or because it is broader than the alleged invention.

The *Corona* case is to the same effect.

The plaintiff has no answer to that proposition except the equivocation which really amounts to nothing more than this, namely, that you may add borate and you may add phosphate, if you have a sufficient amount of sulphate present, and the presence of those additional substances will not do any harm.

So much for that defense which I think is an absolute one and a new one; of course, new, because the record here is diametrically opposite on that subject from the same witness as it was in the *International* case.

Now, I come to this Udy defense, a defense in which I am tremendously interested, and in which I know your Honor will be, and I am interested in it for two reasons, first, because of the merits of the defense itself, to which the voluminous documents of Udy speak eloquently.

Second, because there is no contention with reference to the dates involved. Udy was clearly ahead of any date asserted for Fink, and finally I am interested in it because of the way in which it was finally dragged into this case by us through good fortune and in spite of everything that this plaintiff did to thwart our efforts.

Udy, as your Honor knows, was a chemist of wide experience and of great ability. He started in 1922, just two years ahead of the earliest date claimed for Fink, as an employee of the Union Carbide & Carbon Company, to develop a chromium plating operation. As we shall see in a moment, the Udy process upon which we depend here as a complete prior invention with reference to the Fink patent, culminated in a reduction to practice by Udy in December 1923. Udy's application covering that process was filed in June 1924, and it is of some amusement that I read continuously in the plaintiff's three briefs, about the "abandoned Udy application," as if the term "abandoned" applied to that application, were something derogatory to that application and to Udy's work.

Your Honor remembers that that application was abandoned by the plaintiff, and not by Udy, by the plaintiff in this case after it acquired it, and it abandoned it as one of the means it adopted to preclude if possible this defense coming up in a case of this kind.

So that every time they use the word "abandoned" in their three briefs, in

referring to this Udy application, they are referring to something which I would not be proud of if I were in their shoes.

The Udy application as I said was filed in June of 1924, and went along with prosecutions and actions by the Patent Office until early in 1926, in April, to be exact, when the Fink patent issued.

The Fink patent had been applied for only in December 1925, eighteen months after Udy's application. The Fink patent was issued inadvertently by the Patent Office. They did not cite against it any prior art. They did not cite the Sargent article. They did not declare an Interference with Udy. Inadvertently they issued the Fink patent application as filed within a few months after its filing.

In April 1926, Udy seeing the Fink patent, immediately copied the claims and then put them in his application, thereby calling the attention of the Patent Office officials to the fact that the Fink patent had been issued inadvertently. The Patent Office immediately admitted their inadvertence and declared an Interference between Fink and Udy. This was in the middle of 1926.

At the beginning of 1927, before anything had happened in this Interference, there was another Interference between Fink and Udy relating to a hollow anode, a mechanical matter. Udy's testimony was taken in that other Interference in January of 1927, and that testimony of Udy's taken in that Interference, on behalf of the Carbide Company, showed to the Fink interests that Udy could establish priority with reference to this main process that is involved in this case.

Critchett, an official of the Carbide Company, who testified here, stated in his testimony rather naively that previously an effort had been made by the Carbide Company to form some sort of a combination with the Fink interests, but without success. Now, this Interference came along, the Udy testimony was taken in the other Interference showing Udy's priority. What did Fink do then? He immediately filed a motion in the Patent Office, knowing that he was defeated on priority, filed this motion urging the Patent Office to dissolve the Interference on the ground that Udy did not disclose the Fink invention. That was argued fully by both sides before the Patent Office, and the Patent Office denied the motion. They held again that Udy not only had the Fink invention, but that he had disclosed it in his application of June 1924.

They reiterated the holding that they had in that regard in declaring the Interference. There was nothing for Fink to do that would enable him to win that Interference through contest. He knew Udy could beat him on dates, and he knew now that the Patent Office insisted that Udy had the Fink invention.

So then, although previously no progress had been made by the Carbide Company in trying to form a combination with the Fink interests, then the Fink interests came to them and said:

"We will combine now and we will settle this Interference."

So they did combine, and in August 1927 this plaintiff was formed out of that situation, and when it was formed it owned both the Fink patent and the Udy application.

Thereafter, they decided they would settle this matter of the Interference by ordering Udy, who was a year and a half ahead of Fink in the Patent Office, by ordering Udy to concede priority to Fink. Udy protested. He said, "I am the inventor of that. Why should I concede priority?" And he refused to do so unless he was ordered to. The result was that he was ordered to. And the letter which they sent to Mr. Udy telling him to concede priority to Fink, is a very interesting one in itself, interesting because it says nothing about who was actually first, nothing about a decision based upon evidence with respect to who was first.

Udy was not even consulted in the matter as to who was first, but here was the letter at page 524 of the record.

"Dear Mr. Udy: Will you please sign the enclosed concession of priority, and acknowledge it before a Notary Public, and return it to me. This

step, it has been decided after much discussion here, is in the best interests of our program in connection with chromium plating."

That was all the reason Udy could get as to why he was compelled to concede priority to Fink. The plaintiff now tries to hide behind Mr. Gifford's toga, and they say Mr. Gifford decided it, and it must be right. Why did not Mr. Gifford testify at the trial or by deposition as to why he decided it?

When we tried to find out from the only witness who was put on the stand in that connection, Mr. Rogers, and asked him whether Mr. Gifford had had before him when he made that decision, these Udy records which were withheld from us, Mr. Rogers said, "I do not know."

Obviously, Mr. Gifford's decision carries no weight whatever, because we have no way of knowing upon what factors or upon what evidence he made that decision, if indeed he did make it. But it is significant, I think, that there is nothing in this record from Mr. Gifford himself stating that he did render that decision or give that advice.

And it is curious also that immediately it was decided by some one that it was to the best interests of their program to have Udy concede priority, it was also decided that it was to the best interests of their program to take all possible steps in the Patent Office to prevent the public knowing of Udy's early work. There was this hollow anode Interference.

Both applications had been allowed, Udy and Fink. They were contesting priority, one or the other of them was entitled to a patent for a valuable improvement in mechanism, but as soon as one of those patents issued, then this Udy testimony would become public, and so they immediately abandoned both of those applications.

And not only that, but having abandoned those applications, they wrote to the Patent Office and petitioned them to return the Udy testimony that had been taken. I think that petition for the return of that is rather interesting. I hand up a copy to your Honor, and it is Exhibit 70, page 180.

Paragraph 5 is the reason why this testimony should be returned. It says:

"He, Udy, has other applications pending before the Patent Office,"—

and this now abandoned application is the only one we know of, the one that we are intimately involved with here—

"the subject matter of which is in whole or in part disclosed in the depositions which have been filed herein, and that he desires to maintain secrecy with respect to these related applications and their disclosures."

That I suppose also was to the "best interests of our program."

"That the depositions which he has filed herein can serve no useful purpose in view of the manner in which the Interference is being settled and that he believes the depositions while they remain in the Patent Office may make possible the premature access of hostile parties to the disclosures on said applications."

And "said applications" is this Udy application disclosing the Fink invention.

If they were so sure they were right, and that it was to the best interests of their program to have Udy concede priority, why did they take all this trouble to try to prevent the public learning about the Udy application and the Udy testimony?

Not only that, but there was another application, a Fink & Eldridge application which had originally been involved in the hollow anode Interference, and which therefore contained reference to it, and which if it issued into a patent would open up the history of that Interference to the public. That application they had prosecuted through appeals in the Patent Office at great expense and obtained nine allowed claims in it, and yet after the application was allowed they abandoned that also for the "best interests of their program."

Plaintiff pleads now piety. They say in effect, "You have learned of this Udy defense. You found out through records which were available, that there was such a thing, and then you proceeded and petitioned this Court and petitioned the Patent Office, and turned the world upside down and finally did get this information, and so we are entirely pious in the matter;" which means merely this, that they were not quite good enough.

They took every step they could possibly take in the Patent Office to prevent

any knowledge of this situation becoming public. There is not another thing they could have done in the Patent office to prevent this from becoming public, and yet since they were not able to cover the trail completely, they say "We are blameless. You have discovered the Udy defense."

I reply to that that in the previous case the defendant did not discover the Udy defense, and I think perhaps the reason we discovered it was because our back was against the wall. This patent had already been sustained, and we left no stone unturned, no lead which we did not follow to a conclusion in order to upset this patent. That is the reason we discovered this Udy defense and the *International* defendant did not.

They also say that Udy was let go by the plaintiff interests without any strings attached to him, but it is rather significant that the *International* case was tried in May 1931 and Udy was not let go until July in 1931.

Finally we obtained these papers in the Patent Office, as I have said, and feeling that Udy was still affiliated with the plaintiff in spirit, we subpoenaed him and examined him by deposition more or less as a hostile witness. He had no records, or he thought he had none, so that his deposition was not particularly helpful, except that in that deposition he said that the Carbide Company had records of the work which he had done.

We immediately subpoenaed Dr. Beckett of the Carbide Company to bring with him all of the Udy records, and then a very strange situation happened.

Dr. Beckett brought the records contained in these two volumes, and he did not bring the records upon which we here rely in establishing this Udy defense. Udy's early work was concerned with the Sargent formula. They brought us all the records of Udy on the Sargent formula. The Udy application which subsequently the plaintiff abandoned, was filed in June 1924. We had that. But among the records, your Honor, which they gave us at that time, there was nothing preceding this June application of Udy's having anything whatever to do with this SO_4 formula which forms the basis of our defense here, not a thing.

The significance of that is that the plaintiff claims for Fink the invention date of May 1924. They were willing to give us the records after Fink's alleged invention date, relating to the SO_4 proposition. They gave us those. They were willing to give us everything that dealt with the Sargent process, and which ran up until the fall of 1923; but in between there was this wide void which we now find should have been filled with the very best documentary evidence I have ever seen in establishing a prior invention.

Why did they not produce them? We have asked them that in this case, your Honor, at the trial, at the opening argument, at the trial, in each of our briefs we have asked "Why did not you produce them?" Mr. Udy has shown that those records were produced with five carbon copies, and yet none of them were given to us.

Still we have no explanation. Mr. Scull's feeble comment this morning was, "Well, Dr. Beckett must have been soft in the head if he destroyed them." We do not know whether they were destroyed or if so, when? We do not know anything about it. It seems to me that if I had a client who was charged with withholding evidence, and I could prove that everything was *bona fide*, that an attempt had been made to locate them, and they were not found, I certainly would produce that evidence.

Yet here we have nothing, your Honor; no attempted explanation of why not one of those five carbon copies of these most important, crucial records were not given us.

When Dr. Beckett did not produce those records, of course we did not know then they were in existence, but it looked as though there was a void in there, and so we went to Mr. Udy again and said, "Here is what we have been given. Is this all?" Mr. Udy is human, I think, and he was then persuaded that something was wrong. He said that he would go back to Anniston and he was then on his vacation at Niagara Falls, and see if perhaps he had his copies of these records. He went back and fate was with us; he did have them, and he produced them, I think, it was not more than a week before the trial that we got these records which completely defeat the Fink patent.

Then of course we thought there must have been some mistake in the failure of the Carbide Company to produce them; probably the Carbide Company had turned them over to this plaintiff at the time of the settlement; and so in order to be perfectly fair, and to give this plaintiff every possible opportunity, we served upon them, before the trial, a Notice to Produce at the trial every scrap of Udy evidence which the plaintiff had or the Carbide Company had, and to which we had not yet been given access.

That notice was read to them at the trial, and still they did not produce these records; and then as your Honor knows, Udy took the stand and produced them, and we have as a result, solely because Udy happened to keep his set of records, what I consider to be the best documentary prior invention defense that I have ever seen.

Mr. Cooper suggests that it is appropriate at this time to refer to the recent *Keystone* case in the Supreme Court which is referred to in our main brief at page 25, *Keystone Driller Company vs. General Excavator Company*, 54 Supreme Court Reporter 146.

There the plaintiff was found to have suppressed evidence in a prior case with reference to one of the patents in suit, and the Supreme Court held that in the case at bar, the plaintiff must be deprived to any remedy with respect to any of the patents because of its unclean hands.

I say, your Honor, realizing its seriousness, I can not explain, I can not attribute, any other motive to the plaintiff in refusing to try to explain their withholding of these records, than a motive of unclean hands. It certainly has that effect, and I see no answer to it.

We have been waiting, and waiting, and waiting, for some explanation of why we did not get even one of these five carbon copies of this particular bunch of records when they gave us records on both sides of it, and still we have no explanation of it.

With reference to Udy's work, it is divisible into two parts, as Mr. Scull said. The first part is that in which Udy was working with this Sargent formula, and that continued from the latter part of 1922 until the latter part of 1923. That is not the Udy prior invention upon which we rely in invalidating the Fink patent. That work of Udy with the Sargent process, your Honor, is relied upon by us as complete justification for the defendants' alleged infringing operations, because in that Sargent work, Udy did exactly what these defendants are doing. Udy read Sargent as meaning "chemically pure" when he said chemically pure with reference to chromic acid.

When he first tried out his process, the acid which he used, (and I am quoting from Udy's records) was very pure, and free from sulphur or sulphate or free acid. He proceeded to take that pure acid, as he understood Sargent to teach, and then he added to it chromium sulphate in the proportion which Sargent taught, and then throughout his work, your Honor, he regulated that Sargent bath by chemical analysis from the very start in 1922, and he did that in exactly the same way that these defendants regulate their Sargent baths by chemical analysis, namely, to determine the chromium sulphate content by first finding the sulphate content and then converting it into chromium sulphate.

The record shows conclusively in this case that that is the only way in which you can determine the amount of chromium sulphate in a bath. You must analyze it for sulphate and then calculate the chromium sulphate; and, if your Honor remembers the Court of Appeals decision with reference to the Westinghouse Company, the Court of Appeals said that the fact that Westinghouse analyzed for SO_4 was unimportant in bringing it under the Fink patent because the Westinghouse Company did so only by way of calculating the chromium sulphate content.

So here these defendants do it only for calculating the chromium sulphate content. Udy's documents which were furnished us by the plaintiff describe fully his work with the Sargent process. He never failed to obtain plating by the use of that process. Continuously through that work he used the Sargent formula controlled by chemical analysis, adding chromium sulphate where necessary and taking it out when excessive.

True, in 1922, which was three years before Fink ever analyzed any bath,

Udy's method of analysis was not perfect; and, for a time paralleling, not substituted for, but paralleling his work with the Sargent formula, he did work with another bath, which he thought contained only chromic acid, but which in fact he learned later contained also sulphate; but throughout the period I am speaking of, from 1922 until the latter part of 1923, Udy continually used the Sargent process, using pure chromic acid and analyzing it for chromic acid and for SO_4 to determine the chromium sulphate, and in that way regulating the bath to the Sargent formula.

Udy was a very ingenious person, as I have said. This first acid he got was described by him as being exceptionally pure, and free from sulphate. Later acids which he had got, he found were not. So he himself purified them by the barium hydroxide method which none other than Professor Stevenson has testified in this case, was a perfectly feasible and practical method, as you will see quoted in our briefs.

Those are the particular points I wish to stress in connection with Udy's work with the Sargent formula, first, he insisted upon substantially pure chromic acid. Your Honor said that Sargent was defective because he did not tell how much sulphate there was in the chromic acid. Udy took the Sargent formula, understood it to mean pure chromic acid, and he insisted upon pure chromic acid even though he had to purify it himself.

The second is that he controlled the Sargent formula in exactly the way these defendants are controlling it, by chemical analysis.

Your Honor, preliminary to the discussion of the real Udy process which is urged here as a complete defense against the Fink patent, I should like to refer to something concerning which Mr. Scull said very, very little this morning, and that is to the Court of Appeals decision in the *International* case setting forth what the Fink invention actually was.

At pages 9 and following, of our main brief, I have set forth the parts of that Opinion in which the Court distinguished the Fink alleged invention from Sargent and pointed out what it was that Fink was supposed to have described.

As we have seen in our discussion of Udy, Sargent disclosed the use of chromium sulphate, sulphate as the addition agent, and the Court of Appeals said, as we have quoted on page 9:

> "It is clear that he (Sargent) supposed it necessary to add chromic sulphate to the solution. His theory was that when the chromic acid used contained traces of sulphuric acid as an impurity, this united with the chromium and formed chromic sulphate. It might be necessary to supplement this. Ordinarily it would be; but the essential in the process was chromic sulphate. With this and with this alone, except in one unsuccessful case, he experimented, his results were stated in terms of the proportion between it and chromic acid, and the art followed him. Some of his proportions are well within Fink's, though more than Fink's optimum, but he was thinking in other terms. The step may seem easy, having gone so far; but the art did not find it so. Chromic sulphate contained the radical; the sulphuric acid in the chromic acid which combined to form chromic sulphate, also contained in it; but Sargent did not intimate that the radical alone need be controlled. He had not found the critical element, and his followers never could depend upon his process.
>
> "Schwartz worked with Fink upon the experiments which finally took form in the patent in suit. In 1923 Fink read a paper which Schwartz had written. It is important only as showing what he, intimately acquainted with Sargent's work as he was, and competent to push forwards its implications, had in three years been able to do. The percentages again are well within Fink's, at times about his optimum; and some of the results were good, but still there was no suggestion that it was not necessary to use chromic sulphate."

Then I will skip to the latter part of that quotation.

> "Sulphuric acid today is a common form in which to add the catalyst; as an impurity in chromic acid it is a catalyst. No one understood this or could until it was learned that it was the radical in any form which did the work'

What Fink really did was to single out the acid radical and the catalyst, disregarding the substance which happened to contain it. Nobody had thought of this before, and for that reason nobody had found a dependable process."

Then in order to reiterate what it was that Fink was supposed to have invented, the Court added:

"It was only after repeated experiments that it occurred to Fink that the radical alone was the catalyst, whether in chromic sulphate, in sulphuric acid, or not a sulphate radical at all. The optimum ratio then followed from trial and error."

Your Honor, Mr. Scull said this morning that at such and such a time, Fink made his discovery, that it was the acid radical that was the determining factor.

With reference to the matter of regulation at page 12 of our brief we have quoted what the Court of Appeals had to say about that.

"This was the commonest practice in the art generally. This we need not dispute; it would indeed seem a very plain thing, when success depends upon the proper proportions of the ingredients and the bath is used repeatedly to take periodic samples of the solution and correct any variations which occurred.

"The regulation of the bath was described in part in the specifications; in general, the art knew it. The anode is not defined; it need not have been, for Sargent had worked out that part of the process and the art knew that too. The invention lay not in any of this," - -

That is, not in regulation— "but as we have said, in the composition of the bath, which nobody before had described or known."

I mention that not because Udy did not regulate, because he did, as we shall see his records are full of analysis after analysis during all of 1924, during which time Fink never analyzed any bath; all that time Udy was analyzing his bath and controlling it after every eight-hour run during the continuous runs, and as frequently as necessary during his plating operations.

So that that is not a matter of significance in this case except this, that I am anxious to set before your Honor what it was that the Court of Appeals thought was Fink's invention. It was not regulation, it was not any of these trivial things that we hear the plaintiff talking about, but what the Court of Appeals said was what Fink really did was to single out the acid radical as the catalyst, disregarding the substance which happened to contain it.

It is rather interesting, I think, the way this Udy process upon which we rely, developed. Udy had been working for about a year with the Sargent process, and towards the end of that year he was working on a problem with reference to the anode coatings, and he described that work at page 570 of the record,

There we find what we usually do not find in connection with this prior use, a description of the birth of this invention, page 570 down near the bottom. I will read from his report of November 21, 1923:

"During our recent work on the concentration of chromium acid solutions for electrolysis, many things pointed to the anode and anode coatings as of more immediate importance than the concentration. It was noticed that we could not obtain so good results with our present solutions as with our original solutions; in fact, no solution which we have worked up to this time has given quite so good results as our original solution. The only cause for this difference seems to be in the anodes and their coatings. It was therefore decided to investigate this point before continuing the work on concentrations. Part of this work is completed and much light is given on the subject. While not complete, the work is reported herein."

Then Mr. Udy explains what he meant by that.

"In using the Sargent bath I had noticed a gradual building-up of high voltage and also the anodes were becoming heavily coated. These anodes were not taken out of the bath at night. They were used alternately, and a considerable coating was building up on the anodes. It was natural for me to think that possibly this coating was causing the increase in voltage. It was a thing I did not want. I wanted a lower voltage to lower my cost so I decided to investigate these coatings on the anode, and I found in so doing, I found that while the cell was in operation, the coating on the anode was a lead

peroxide; when the cell was not in operation, it worked in the opposite direction, and the coating became a lead chromate, and then I conceived the idea at that time of sulphating those anodes to see what the effect of the sulphate on the anode was."

Remember, he was still working with Sargent, and this was an offshoot investigation to see what would happen if he sulphated the anodes. Then the question was:

Q. 154. "What do you mean by 'sulphating the anodes'?

A. "Putting a coating of lead sulphate on the surface of the anode—"

And then skipping a sentence —

"Well, I tried that sulphate on the anodes, and I found that my sulphate from the lead sulphate on the anode went in solution at that time. I knew then that I was adding not chromic sulphate, but SO_4, and that opened up the thing and lead to the final conclusion of the whole process."

And then continuing the quotation —

"In order to determine the effect of the anode and anode coatings in electrolysis of chromic acid, a solution of chromic acid was made, and all of the sulphur precipitated with $BA(OH)_2$. This solution was used with new anodes—

Q. 154a. "This treatment with $BA(OH)_2$ was for what purpose?

A. "It was to remove all sulphate from the chromic acid.

"The first runs were made with bright lead anodes and after each eight-hour run the anodes were removed, the coating brushed off and a bright lead surface formed for the next run. They were then allowed to stay in solution and the coatings accumulate. In both cases, lead chromate was formed at the anode and a brown oxide at the cathode. No metallic chromium was produced in this case."

Now, why was it not produced? — Because he was using very pure chromic acid—

"No material reduction of chromium took place and the solution remained a bright orange color. There was no darkening of the solution whatever."

Q. 155. "What did this show with reference to your early conclusions that you had been able to plate from a pure chromium solution?

A. "It showed positively that the earlier tests in that respect were in error."

Then he goes on—

"We next began to sulphate the anode after each run, and the results were entirely different."

Since they began adding sulphate, the results were entirely different—

"The formation of PB CrO_4 at the anode was stopped and metal began to deposit at the cathode, reduced chromium increased in solution and the solution became dark in color. After a few sulphatings of the anodes it was evident that we had a solution exactly like our original solution and was getting as good current efficiency. Sulphating of the anode after each eight-hour run was continued until the sulphur content of the solution was equivalent to .94 grams SO_4 per 100 c. c. or 1.23 grams $Cr_2(SO_4)3$".

And then they ran this test adding sulphate after each 8-hour run to find out what was the best content of sulphate.

Now, your Honor, turning to page 580 of the record:

"On October 10, 1923, we began a series of runs to determine the effect of anode coatings in the electrolysis of chromic acid. This work showed the effect of PbO_2, $PhCrO_4$ and $PbSO_4$ coatings on the anodes and finally resolved itself into the determination of the effect of SO_4 in solution."

And there, your Honor, was the birth of this invention.

Udy had in a sense, stumbled on it, but when he reached it, he recognized the fact that he had been all wrong before, in assuming that Sargent thought chromium sulphate was necessary. He now found that the crucial thing was SO_4, and he immediately proceeded to find out just how much SO_4 should be used.

Then at page 584 of the record:

Q190. Now, will you please turn to page 10, to the curve there shown, and tell me what that is?

A. "That shows the grams of SO_4 per 100 c. c. of solution plotted against current efficiency and kilowatt hours per pound of chromium.

Q191. "And what, if anything, did you determine from the results plotted on that curve?

A. "From the results plotted on this curve, it shows the optimum SO_4 content per 100 c. c. of solution at between $2\frac{1}{2}$ and $4\frac{1}{2}$ grams per litre.

Q192. "Was that a determination to which you adhere?

A. "Yes, sir.

Q193. "For how long?

A. "For the total time thereafter that I was in chromium plating.

Q194. "And how long was that?

A. "That was up until 1931."

Mr. Cooper: That was after the former trial, after he was fired.

Mr. Clark: That was after the former trial. I will proceed with reading from page 585:

"Discussion of results: This series of tests show practically the same results as those reported November 22, 1923. They appear to be somewhat more consistent, and while the reductions in SO_4 have not been in equal amounts for each test or in so small amounts as desired, they have been in such proportions as to establish certain very important facts. Points of importance that have been established are: First: The limits and importance of SO_4. Second, the non-existence and unimportance of $Cr_2(SO_4)3$."

I think your Honor still has in mind what I read from the Court of Appeals decision in this case, that nobody before Fink, had realized that chromium sulphate was not essential, and no one before Fink had picked out the SO_4 as the thing to look for. The particular words that the Court of Appeals used, were:

"What Fink really did was to single out the acid radical as the catalyst disregarding the substance which happened to contain it."

And here, in 1923, long before any date even asserted for Fink, Udy was saying that the first point of importance which he had established, was the limits and importance of SO_4; and second, the non-existence and unimportance of chromium sulphate, which Sargent had championed.

The next page of the record is very interesting. I am trying to skim over this case as there is so much of it, to along about the middle of the next page, he said, and this is now page 586:

"This, therefore, is evidence that for the production of chromium electrolytically from chromic acid using lead anodes, the solution must contain a small amount of the acid radial, and in the case of lead anodes preferably SO_4. No doubt other acids would serve the purpose, but they would also give soluble lead salts and cause greater attack on the anodes."

And then he goes on on the next page to say:

"The quantities of SO_4 in solution are fairly well established and can clearly be placed between .25 grams per 100 cc. to .45 grams per 100 cc. These limits gave the best results."

And then at the bottom of that page, Udy says further:

"The following conclusions are drawn from the work given in this report and also in our report of November 22, 1923."— the third paragraph down:

"The limits of SO_4 in solution for the best results is .24 grams SO_4 per 100 cc. to .45 grams SO_4 per 100 cc. of solution. Good results are, however, had with .15 grams to 1 gram SO_4 per 100 c.c. of solution. As against Sargent and other investigators, we have conclusive evidence that $Cr_2(SO_4)3$ is unimportant and cannot exist under the conditions of operation."

And then he says he is going now to investigate the matter of the concentration of chromic acid in the solution.

Now, page 591 of the record under "Procedure."

"In the past we have made several attempts to determine the effect of concentration in the electrolysis of chromic acid solutions, but did not establish satisfactorily the limits of chromium in solution. The solutions

did not give us the proper results that we have later found to be possible. In this series of runs we have applied our more recently attained knowledge to our solution and have succeeded in getting very good results."

Q. "What do you mean by 'our recently attained knowledge'?

A. "The attempted concentration had been tried when we were using the Sargent bath. After we had found that we could put the SO_4 into the solution with sulphuric acid, then we returned to the problem and made the concentration, or determined the most effective concentration of the chromic acid under the new make-up of solution."

And then he goes on to say at the bottom of this page:

"After each eight-hour run the solution has been brought to approximately the same volume, sampled and analyzed."

And then at the top of page 593:

"As in our previous work, we have analyzed the solution for sulphur as SO_4, total chromium, oxidized chromium and reduced chromium."

And then he says that from now on, he did not even bother to calculate the equivalent of the chromic sulphate; and then at page 602 of the record, "Summarizing our work to date,"—

This was still in very early 1924; and then he goes on with a rather technical chemical discussion, which I will not read; but on the next page, 603, he says:

"The governing factors in electrolysis of such solutions are the SO_4 content, the concentration of chromium in solution and the temperature. The limits to the above factors have already been made and discussed.

Q. 229. "Did this represent to your ultimate conclusion upon these points?

A. "Yes, sir, that is the ultimate conclusion on that work.

Q. 230. "On the matter of the electrolytic solution?

A. "On the matter of the electrolytic solution and on related problems.

Q. 231. "And from this time on — and this report is dated February 4, 1924 — did you make any change in the solution as worked out in these tests which you are reporting in this report?

A. "I made many tests and did much work to improve it, but never changed that solution or those specifications.

Q. 232. "Never changed the limits that you gave?

A. "The limits of the specifications that I made for that type of plating.

Mr. Clark: "Page 34, Conclusions:

"The results of our tests on concentration have given the best results between 7 grams of chromium per 100 cc. to 20 grams of chromium per 100 cc. solution. The very best results were had between the limits of 8 grams to 15 grams of chromium per 100 cc. The highest current efficiency and lowest K. W. H. per pound of chromium were had at 12.3 grains of chromium per 100 cc.

Udy had the practice of giving chromic acid in terms of chromium, you multiply that by 2 in order to convert it to chromic acid. So that with respect to concentration he had determined that Sargent was right in recommending a concentration of 2.45 grams of chromic acid per liter.

Then he goes on repeating more or less these results, pointing out on page 607 of the record that the particular recommendation there involved a ratio of exactly 100 to 1 in the chromic acid with reference to the sulphate.

He also found, as appears to be still undisputed, that above 600 grams per liter of chromic acid, you can not get good results.

Now, I should like to turn to Exhibit No. 71, which is the book which was furnished us by plaintiff, and I might add, lest your Honor forget, that these things in these records from which I have been reading, were furnished us by the plaintiff. They are all things that we got from Mr. Udy. On page 130 of Exhibit No. 71, we find a Udy report. This is dated March 17, 1924, and it is Udy's weekly report of work on hand:

"Patent Literature. I have received considerable patent literature from Mr. Critchett, which I shall go over in connection with our process and point out the differences."

This was March 17, 1924, and he certainly did do that.

On March 27, 1924, he presented with five carbon copies, this preliminary patent specification of his, in which he described fully these discoveries that he has made, and this work that he had done, and in which he also distinguished his process from these prior processes.

So we will turn to page 610 in the record, if your Honor please.

Q. 246. "At page 42 (Defendants' Exhibit No. 73) is a document from which I read this morning, entitled 'Electrolytic Chromium Preliminary Specifications, Covering Details of Process.' What is that? It is dated March 27, 1924.

A. "That is my attempt to write up in patent form and sum up the entire work of chromium plating as I had carried it out."

Then will your Honor skip a question and objection.

Q. 248. "Please state whether it represents the work actually done by you?

A. "Yes, sir.

Q. 249. "What did you do with this report or preliminary specification?

A. "I mailed those to the New York office for use of the Patent Department of the Company.

Q. 249a. "You kept this one copy for yourself?

A. "Yes, sir.

Q. 250. "This is the copy from which the photostats have been made?

A. "Yes, sir."

And then we will read from the first part of this preliminary specification, just below the middle: (Page 611)

"This invention has for its object the electrodeposition of chromium for plating purposes and for the manufacture of very pure metallic chromium. The principal novelty of this process is the simplicity of the electrolyte used, its preparation, and in the control of certain factors which heretofore have been held to be essential for the deposition of chromium metal, but which I have found to be the results of deposition rather than the cost.

"To what were you referring in that last clause, Mr. Udy?

A. "Well, I was simply referring to the fact that we had found the SO_4 as SO_4 was the controlling factor and not chromic sulphate."

And now about two-thirds down: (Page 612)

"After briefly describing my process, I shall take up the various points of difference between my process and those of earlier investigators and show wherein my process is different. In preparing the solution for my process, I take ordinary chromic acid and dissolve it in water to give a solution containing from 10 grams chromium up to 30 grams chromium per 100 c.c. of solution. To purify this solution of impurities such as sulphur, as sulphate, which is nearly always present in chromic acid of the commercial variety, I add a saturated solution of barium hydroxide, until all the sulphur is precipitated, and allow the solution to settle or filter, as the case may be. The solution resulting from this operation is practically pure chromic acid, which will contain a small amount of barium. This residual barium is very carefully precipitated with sulphuric acid, so that the resultant solution is practically free of both sulphur as sulphate, and barium."

Note this, that he took the precaution of adding an excess of barium to get the sulphate out, so that he had a little barium left — (Page 613) —

"This solution is now ready for use and is added to the cell as required to maintain the chromium content. Within certain limits I have found to be best, in preparing electrolyte product, I take a sufficient quantity of pure chromic acid solution as prepared above and dilute it to give a solution containing between 10 grams chromium and .15 grams chromium per 100 c.c. of solution. To this solution I add sufficient free sulphuric acid to give .25 grams to .45 grams SO_4 per 100 c.c. of solution."

That was not reduced to the equivalents with which we are familiar, which is from 200 to 300 grams of chromic acid per liter and $2\frac{1}{2}$ to $4\frac{1}{2}$ grams of SO_4.

Then he states that there is no loss of sulphate, and on the next page of the record, appears this:

"Will you please explain again why it was that you had to make only these additions to the bath?

A. "Simply because the SO_4 during electrolysis is not destroyed, and in doing the type of work I was doing, I had practically no mechanical losses. Therefore, I had no make-up of SO_4.

Q. 252. "In spite of that fact, did you make it a practice of analyzing for SO_4?

A. "Yes, sir.

Q. 253. "How frequently?

A. "As frequently as — it depends on the amount of work going through the cell. If I was making tests, the tests usually lasted eight hours, and the analysis was made after every eight hours. If I was doing plating now and then, I did not make the analysis so often.

Q. 254. "And what was your purpose in analyzing for SO_4?

A. "To keep it under control, according to the specification."

Then at page 616 of the record, referring to temperature and current density, and so forth, he said:

"Having thus described my process, I shall now take up the important factors which require control and explain their part in the electro-deposition of chromium metal. These factors may be divided into two groups, namely, essential and non-essential. The essential factors are the free SO_4 content of the electrolyte, the concentration and the temperature. The non-essential factors are the presence of reduced chromium in solution, either as dissolved oxide of chromium CrO_3, or as chromium sulphate, $Cr_2(SO_4)3$, and the presence of alkali salts, alkaline earth, salts or various organic and mineral acids."

"What do you mean, Mr. Udy, by saying that certain things are non-essential?"

A. "Well, you could simply pin down the control of that solution to the SO_4 content and the concentration."

And now, if your Honor would be kind enough to turn to exhibits, Exhibit No. 73, it is the top of one of these three volumes, at page 48, I will run very briefly through some of the other notes.

Remember, he promised Mr. Critchett he would distinguish his process from this prior art, so on page 48 of Exhibit 73, in this long preliminary specification, he says:

"Having described the essential features of my process, I shall now discuss them in connection with the work of previous investigators and show wherein my process is different."

That is Defendants' Exhibit No. 73.

And then on page 49, the next to the last paragraph:

"Evidently Placet and Bonnet do not consider that impurities are detrimental. In the first paragraph it is evident that they do not use a pure solution of chromic acid because they state that they use phosphoric, sulphurous, oxalic, benzoic, formic, gallic, sulphuric, tannic, lactic, and many other acids in considerable quantities (5 to 10 gm. per litre). The use of these acids is for the purpose of varying the shade of the metal. This I accomplish by simply controlling the temperature of the bath by suitable cooling coils.

"It is plainly evidence that Placet and Bonnet considered that they were using pure chromic acid and that the sulphuric acid merely changed the shade or color of the metal. In reality I have found that sulphuric acid is a necessity and the only necessary addition to pure chromic acid for the electro-deposition of metallic chromium by electrolysis."

And then on page 50, the latter part of the third paragraph, about five lines from the bottom:

"It is only by controlling the sulphuric acid within the limits I have specified and the use of a pure chromic acid free of sulphuric acid or sulfates to maintain the chromium content, that an electrolyte is obtained which has an indefinite life when used as a plating cell or for the production of metallic chromium."

"My process, therefore, differs from that disclosed by Placet and Bonnet in that definite specified concentrations are made which are much higher than those used by them. It is also different in that it uses pure chromic acid to which has been added small amounts of sulphuric acid which is controlled within certain definite limits."

And so on; at page 55 again, he says, the third paragraph:

"In my process I specify definite concentrations and definite amounts of sulphuric acid, and control the products of electrolysis within certain definite limits."

And throughout this long treatise of his upon the subject of this invention, Udy was stating and reiterating exactly the things that the Court of Appeals said was Fink's invention, exactly.

It seems almost ironical that we should find now this paper of Udy's written in 1924, which should use almost exactly the same language in distinguishing his process from the prior art, that the Court of Appeals used in 1932 in distinguishing the Fink process from the prior art.

The Court: 1923?

Mr. Clark: This particular one was made in March, 1924. This long one which is still two months ahead of any date asserted by Fink. They claim that Fink's date is in May, and he went on through, and finally at the last page, had included claims to his invention, page 64, and this is the third claim down:

"A process for the electrodeposition of metallic chromium from a solution of pure chromic acid containing 10 gms. to 15 gms. of chromium as chromic acid and .25 to .45 gms. of SO_4, as free sulphuric acid."

In order to expedite your Honor's consideration of the Udy articles, I have prepared on one sheet of paper a few quotations from this which seem to me to answer completely the Court of Appeals' definition of the Fink invention (handing).

The first one, this is from the Report of 7th December, 1923 (Defts.' Ex. 73, p. 11):

"*Importance and Limits of* SO_4. .

"* * * for the production of chromium electrolytically from chromic acid using lead anodes, the solution must contain a small amount of an acid radical, and in the case of lead anodes, preferably SO_4.

From Preliminary Patent Specification of Mar. 27, 1924:

"* * * The essential factors are free SO_4 content of the electrolyte, the concentration (of CrO_3) and the temperature." (Ex. 73, p. 44)

"* * * the addition of $Cr_2(SO_4)3$ is simply a method of adding SO_4 to the solution and in itself is of no importance." (Ex. 73, p. 59)

"* * * The amount of SO_4 added can be varied with concentration of chromium. I prefer to use a solution containing between 10 gms. and 15 gms. Chromium and .25 gms. to .45 gms. SO_4 per 100 cc. of solution." (Ex. 73, p. 62)

Expressed in terms of CrO_3 and SO_4 in grams per liter, this is:

CrO_3 — 200 to 300 gms. per liter.

SO_4 — 2.5 to 4.5 gms. per liter.

"* * * I control the concentration and the SO_4 content of the electrolyte within the limits I have specified." (*id*)

"Using this solution for plating graphite, over a period of two weeks the average current efficiency was approximately 34.8%. This solution analyzed as follows: Total Cr. 15.35 gms. per 100 cc., Cr^{VI}, 14.31 gms. per 100 cc., Cr^{III}, 1.04 gms. per 100 cc., SO_4, .31 gms. per 100 cc." (Ex. 73, p. 60)

Which is almost exactly Fink's alleged ratio.

And in that connection, I look around the Court room today and do not see the big blackboard that was used in the trial before, and before the Court of Appeals, with the formula CrO_3. That is exactly what Udy had.

SO_4

This last reference to the sheet to which I have referred has to do with the

plating of 400 or 500 pieces of graphite in December 1923, by the use of this formula, exactly the Fink formula.

It was suggested to Udy that that was experimental and he indignantly denied it was experimental, so far as he was concerned. It consists of a complete reduction to practice of the Fink invention by Udy in December 1923. He was working with a large tank and that anode over there indicates the size of it (indicating); and he was doing plating and electro chromium work right along through all this period, and as he said, from this time on up to 1931, when he left the company. He plated frying pans and golf clubs and Prestolite, and everything that they sent to him, and Mr. Critchett said everything he sent for plating was always returned promptly; and while Fink and his associates in 1925 and 1926 were still treating their process as a secret, and handing the formula around in code, even among themselves, Udy was arranging for the commercial operation of his process; and we have here in Exhibit No. 81, dated April 15, 1926, which is before the issuance of the Fink patent, in which the Metal Protection Company was writing to Mr. Critchett—

"I spent the day with Mr. Udy at Niagara Falls, yesterday. During that time we plated the following samples"—and so forth.

This was preliminary to the introduction of the commercial plant at Cleveland of the Metal Protection Company, to the Udy process.

On page 136 of Defendants' Exhibit No. 73, you will find Mr. Udy's report upon the installation of that commercial process at the Metal Protection Company plant. He there outlines and describes in detail the apparatus that was used, and the solution that was used; and here, in 1926, the solution that he used was exactly the one that he had used in December 1923, in plating these graphite rods; and this installation at the Metal Protection Company went into successful commercial operation on the very day on which it was installed, and continued in open successful commercial operation for several years thereafter.

Now, Mr. Scull has the temerity to say that the process installed by Udy at this plant in Cleveland was not the Udy process, for this reason: He says the chromic acid which Udy was then able to obtain was so pure that he did not have to purify it further. Therefore, says Mr. Scull, this was not the Udy process. I do not think I have ever heard so absurd a proposition in a patent case.

Udy's process was not a process of purification of chromic acid. His process was a process of using substantially pure chromic acid with SO_4 in the proper proportions. When he could not get pure chromic acid, he purified it. That was the essence of his process; and it is the essence of all commercial processes today, that you must have substantially pure chromic acid; but when he could get substantially pure chromic acid, needless to say he did not purify it; and this report gives the purity of this chromic acid used here as 99.5 per cent., which is purer than the acid used by these defendants.

And then at page 140 of this book, Exhibit No. 73, we find:

"Instructions for chromium plating," by Udy, dated July 1, 1928. At this time, your Honor, Udy was in effect an employee of the Plaintiff, helping the plaintiff with its chromium plating problems, and in this report of July 1, 1928, Udy said:

"If the solution is made from chromic acid high in HS_2O_4, the H_2SO_4 is first removed by treatment with barium hydroxide."

But if you can get pure chromic acid, it is not necessary to do so.

Following this, we find that Udy was used by the plaintiff in installing chromium plating plants under his process for his various plants and its licensees.

Further, at page 144 of this Exhibit No. 73, we find a long letter from Mr. Herzog of the Union Carbide & Carbon Company, to Mr. Udy, under date of 1929, saying:

"United Chromium, Inc. is very anxious to have at least two of its eastern service men become thoroughly familiar with the process and apparatus for hard chromium plating as installed by you at Worthington, Oxweld

and General Chromium, so that these men can in the future service the installations of this type."

And this plaintiff has the audacity to say that the Udy process was secret, and never went into commercial use.

Not only was it not secret; not only did it go into commercial use at the Metal Protection Company in Cleveland before the Fink-Udy Interference was declared, but after the settlement with Udy, this plaintiff was the most benefited of any one by Udy's work, since they used Udy, as their man, to show their licensees how to do chromium plating; and he installed his process in the plaintiff's own plants, where they are still being used; and yet the plaintiff says that Udy's work was all secret. It is absurd.

With reference to the law on this subject, I think your Honor recognizes this is a defense of prior invention. Udy was the prior inventor of the exact thing that Fink purports to cover by his patent. I think this sheet which I have just handed up to you, when you compare that with the decision of the Court of Appeals, will remove any possible doubt that might exist upon that point.

So, so far as the law is concerned, it does not matter how many people knew about Udy's work. I think the plaintiff has finally come to admit that, although when your Honor reads the briefs, you will see that they try to talk all around the point, and try to misconstrue cases, and try to indicate that a prior inventor is not a prior inventor unless the world knows about his prior work at the prior time; but we have shown in our reply brief that the law can not be denied. For example, at pages 20 and 21. Take the case of *Coffin v. Ogden*:

"* * * the prior knowledge and use by a single person is sufficient. The number is immaterial."

Next the case of *Reed v. Cutter*, which is followed by the Supreme Court, right up to the present time, which says:

"If the invention is perfected, and put into actual use by the first and original inventor, it is of no consequence, whether the inventor's invention is extensively known or used, or whether the knowledge or use thereof is limited to a few persons, or even to the first inventor himself" * * *

Udy's prior work fulfills every requirement of the law.

It was Udy and not Fink who was the first inventor of the subject matter of the Fink patent, as construed by the Court of Appeals of this Circuit.

Therefore, it follows, as night follows day, that the Fink patent is invalid; and that follows from Section 1920 of the Statute, which sets up as one of the defenses, that the inventor, the patentee, was not the original and first inventor of any material or substantial part of the thing patented.

In the plaintiff's reply brief, they have discussed at some length the case of *Corona Co. v. Dovan Corporation*, and it seems to me in reading that, that they have purposely attempted to mislead the Court into concluding that the Supreme Court there upheld the prior inventor defense, because it had been published prior to the date of the patent in suit; but if your Honor will read that Opinion, you will find that that is not the case; that the Supreme Court accorded to the patentee of the patent in suit, the date of February 10, 1919, which was prior to any publication by the prior inventor, and that the patent in suit was declared invalid, because of the prior invention of another person occurring in 1916, under circumstances which exactly parallel in every respect, the situation surrounding Udy's prior work.

In that decision the Supreme Court have quoted in full certain prior records which were made by this prior inventor as evidence of his prior invention of the subject of the patent in suit, and it is rather interesting to read:

"This work was finally recorded in a carefully-prepared contemporaneous report which Kratz left in the files of the Norwalk Company, and which is now produced by Dr. Russell in evidence, that is, when Kratz left the Norwalk Company to go to the Falls Rubber Company, he took with him his record for his use in his future work, so that there are two records of the same thing."

That language is almost exactly descriptive of what Udy did. Udy "recorded in a carefully prepared contemporaneous record" just what he did, and took with him his copy of that report, leaving the other copies with the Carbide Company and the plaintiff.

So much for the Udy defense, which perhaps I have dwelt upon longer than I should, because I am so intensely interested in it.

Another defense in which I am intensely interested, because it happened that I looked it up, is the Manhattan defense.

The Manhattan defense was testified to primarily by Mr. Damon — I do not know whether your Honor remembers Mr. Damon, who was a New England man and wore glasses, and he was absolutely a neutral witness. We went to see him, and he would not talk with us, except with the understanding that everything he furnished us, and everything he told us, he would tell the other side; and we finally had to subpoena him to have him come here.

The importance of the Manhattan defense is in this: That just as Udy looked not to chromium sulphate for his addition to the bath, but looked to the SO_4, which the Court of Appeals said was the thing that counted, so this Manhattan Company, from the very beginning of this work, used a formula which specified the chromic acid content, and the SO_4 content, just as Fink does in the Fink patent.

So those Manhattan workers, just like Udy, did exactly the thing that the Court of Appeals held was Fink's invention. They singled out the acid radical, disregarding the substance that happened to contain it, and that was the thing that they regulated so far as the sulphate was concerned.

I do not know whether your Honor has Exhibit No. 101; I think it is on top here, if you would care to look at it, which contains the exhibits which Mr. Damon produced.

Note that this also, this work also was before any date associated with Fink. On page 2 of this exhibit, we find a conference with Mr. Knox on January 19, 1924. In the third paragraph he immediately suggested —

"He suggested that we take steps to control the composition of our bath by some means, preferably a simple one."

Then turning over to page 5, we find at the top of the page, Mr. Damon was saying on February 5, 1924:

"We are having the electrolyte analyzed from time to time to determine the changes due to electrolysis."

And then we have others of the reports.

On page 8, we find under date of March 24, 1924, "Analysis of Chromium Electrolyte." This your Honor, was in March 1924, and it is shown that Fink never analyzed chromium electrolyte until June, 1925. Here in March 1924, were the Manhattan instructions for analysis, and please note that instruction 6 was "Determination of SO_4."

Then we come at page 10 to a description by Yngve and Damon, showing the particular arrangement of anodes, and so forth, which they had devised, in order to plate as uniformly as possible these very difficult tools, which they were plating. That is, they had to plate both outside and inside, and they had to put on a heavy layer; because, as Mr. Scull explained, those were for stamping out material to make storage batteries, out of a very abrasive mixture, and they put the chromic acid on here in a thick layer, in order to withstand that abrasion. So they had to figure out a very carefully prepared method of racking those articles and of arranging the proper anodes for their use.

Then on page 13, which is page 4 of this exhibit, I should like to read the last paragraph, and particularly the last sentence, which Mr. Scull failed to read when he read the paragraph.

"We have found that the solutions as recommended by Sargent and other investigators are greatly improved by the presence of more trivalent chromium, that is theoretically required to combine with the SO_4 radical present."

That is page 13 of this Exhibit No. 101, the last paragraph.

Now, this is what Mr. Scull did not read:—

"We prefer a solution containing 24½ per cent. chromic acid and about

2½ per cent. of trivalent chromium and about .2 per cent. SO_4."

Not Chromium sulphate, but SO_4. They were singling out the acid radical as the thing that was important, and they did it from the start.

Then if your Honor would turn to Exhibit 103, you will see the analyses of the baths which they made, with the dates. Bath No. 7 is on the first page. There, beginning in March 1924, we have an analysis showing 20 grams of chromic acid, and .23 grams of SO_4, which is almost exactly 100 to 1; and we run all through those analyses of that bath, and we find that throughout that entire operation, the limits of the SO_4 were almost exactly 100 to 1; and they would have to be, if they kept anywhere near their formula, which specified the chromic acid and the SO_4.

The same is true of bath No. 9. Throughout the entire operation of that bath, chemical analyses made weekly at first, and then monthly. That bath was maintained always within the Fink limits, and always, your Honor, it was the SO_4 that was counted, and not the chromium sulphate.

And then bath No. 10, I think your Honor will find particularly interesting, because there the sulphate content ran down at one time, or at least the analysis showed, that there was only a trace of it. What did they do? They first added, as shown over on the right, 260 grams of chromium sulphate, in order to bring the sulphate up, and that did not bring it up enough, so what did they do then? They added 90 c.c. of sulphuric acid; and when Mr. Damon was asked how he happened to add sulphuric acid instead of chromium sulphate, in order to bring up the bath to his formula for SO_4, he said, quite naively:

> "I might put it by saying that the sulphate ion or radical would not remember with what it was combined when it was introduced into the bath."

That is just another way of saying what the Court of Appeals said, namely, that the thing to look at is the acid radical, SO_4, irrespective of the substance that contained it.

Damon said it would not "remember" with what substance it happened to be combined, when it was introduced into the bath; and so we go on with these various baths. Whenever they fell below the SO_4 content of the formula, there was added either chromium sulphate or sulphuric acid, to bring it up; and at times, some of these baths were made up partly with chromium sulphate, and partly with sulphuric acid.

The plaintiff's only answer, the only attempted answer to this very substantial work, the amount of which is evident from the list of it contained in Exhibit No. 104 — the only attempted answer is that this particular gentleman thought that not only the SO_4 was important, but also that the trivalent chromium content was important, trivalent chromium not being mentioned in the patent in suit; but when your Honor remembers that the plaintiff itself analyses all of its licensees' baths, not only for SO_4, but also for trivalent chromium, surely it is nothing against these early workers that they knew enough to do that in 1924, even though Fink did not know enough to mention it in his patent at the end of 1925.

I do not care whether Mr. Damon and his associates thought you should have a little more trivalent chromium than some other people thought you ought to have. That is not the point in this case. The point in this case is — was Fink the first man to single out the acid radical as the important thing to be controlled, and to provide a formula specifying that acid radical, without reference to the substance that happened to contain it?

This Manhattan use shows, just as the Udy proofs show, that he was not.

I think that the Manhattan defense is interesting for many reasons which I shall not have time to dwell upon, but it is interesting, particularly for this reason: In the plaintiff's main brief, they pointed to some notations in the records of the Manhattan use, showing that at times there was "peeling," or something of that sort, going on, that was not quite right; and they implied in their brief that that showed that these Manhattan people did not know what they were doing; that there must have been something wrong with their solution; but when we look at the record, we find that in every instance where

there was trouble to which the plaintiff refers, the bath was almost identically 100 to 1, or almost identically the Fink formula.

The fact is that these Manhattan workers had troubles not connected with the bath, just as the plaintiff's own licensees had tremendous trouble for these various reasons.

The one question with which I would like to leave this Manhattan defense is this: Is the plaintiff willing that these defendants should take the Manhattan formula, calling for chromic acid, trivalent chromium and sulphate radical in exactly the proportions of that formula, and use it in exactly the way in which it was used in these Manhattan baths, wherein the ratio of chromic acid to sulphate was practically always definitely within the Fink limits, and almost exactly 100 to 1,— is the plaintiff willing that we should use that process in that way, and if we do use it in that way, are we infringing?

Of course that answer is that they would not be willing that we should do that because that gives exactly what Fink taught. That which infringes, if later, invalidates if earlier. The Manhattan process definitely infringes the Fink patent as construed by the plaintiff, and therefore it definitely anticipates that patent.

The Court: Five minutes.

(After a short recess.)

Mr. Drury W. Cooper: The issue of infringement, if your Honor please, is that to which I shall give particular attention in what I have to say, and I should like to say at the outset that so far as the New Departure and Bassick Companies are concerned, there is no issue as to the facts.

The facts are as stated by present or former employees of those companies when examined by the plaintiff's counsel.

So far as the General Motors is concerned, I think it is not amenable to this suit. It is a Delaware corporation which practices chromium plating and has done so from 1924, as the plaintiff proves, but in the State of Michigan where its plating plants are located; but so far as Connecticut is concerned, while it has an office here at the office of the New Departure Company, the Statute is perfectly clear that a non-resident may not be sued for infringement in any district unless he has both a regular and established place of business there and has committed a completed act of infringement, and that means not a contributary act, not an offer for sale, for example, not an act completed through another, but an act completed by himself within the District.

The cases are in our brief, and particularly the case of *Cutler Hammer Company against Curtis*, in 296 Federal Reporter, in this Court of Appeals, and the cases seem to me clearly to exclude the General Motors from the charge of infringement within this District in this suit.

So far as concerns the other two defendants, the Bassick Company and the New Departure Company, I want to remind your Honor that while the facts are undisputed, they do not settle the question of infringement; that is to say, the burden always rests with the plaintiff to prove infringement against a defendant. The burden never shifts. The plaintiff has the burden of showing that the facts proved do constitute an infringement. If upon the facts had, we are still uncertain, whether they were justified by the prior art or whether they were justified by the decision of the Court of Appeals in the *International* suit, as to what relation the prior art bore to the patent in suit, if it were uncertain, for example, whether the New Departure or the Bassick Company practice is like the Sargent disclosure of the prior art, that uncertainty would mean that the Bill should be dismissed because the burden is on the plaintiff and doubts must be resolved against it.

So, to put it the other way around, if your Honor is either satisfied that what we do is like Sargent or like the Westinghouse prior use, which the Court of Appeals distinguished from the Fink patent, or if your Honor is in doubt upon all the evidence on that point, the judgment must go to the defendant, for the plaintiff has the burden.

My proposition is that what each of these two defendants does, is like Sargent, just what Sargent discloses, what the Court of Appeals attributed to

Sargent, what the Westinghouse Company did; and moreover, what the General Motors did with Sargent before ever the Fink patent was even applied for.

If your Honor please, my brother on the other side does what I submit, if it were at all important, would be a perfectly unlawyerlike thing to do, and that is he makes an appeal to evidence which he says was in the former case, to which we are not a party, for the purpose of showing that our practice is identical with the practice that your Honor and the Court of Appeals held to infringe. I think it is quite idle for him to attempt to do that on the face of things, and I will tell your Honor why.

In this case he only charges infringement with respect to six claims of the patent. They are Claims 4, 6, 10, 13, 16 and 18. In the former case, as your Honor said in your Opinion, and as the Court of Appeals said, the claims which were there involved, included, 1, 2, 3, 5, 11, 12, and 15 that are not before your Honor here, and more than that as your Honor says at the end of your Opinion in the former case,

"The defendant admits in its brief that it practices the invention described, for example, in Claim 15 of the patent."

That claim is not even charged against us, and if your Honor will glance at it just for a moment to see that there is a substantial difference, you will see that claim 15 in the former case included this:

"A method of electrodepositing chromium from solutions of chromic acid comprising reducing chromic acid at the cathode in presence of a catalyst, and of a protecting hydrogen film, said film being of a thickness sufficient to prevent oxidation of the chromium ion released at the cathode."

That film of a designated thickness, that film of hydrogen of a designated thickness, was in all the claims that were in the former suit, but which are not here, and there is no claim in suit against us that has anything to do with the so-called hydrogen film except Claim 13 which simply speaks of a protecting hydrogen film.

It is manifest that the plaintiff here is quite unable to charge the defendant with a process in which there is a protecting film at the cathode, a protecting hydrogen film at the cathode of a given thickness sufficient to prevent oxidation.

So I say on the face of things, the case here as to infringement is not the case that was before your Honor previously, for there the defendant admitted that it infringed the narrowest claims of all, if they were to be held valid, whereas here the plaintiff does not even charge these narrow claims to be infringed.

There is not only as shown in this prima facie way substantial difference in the defendants' procedure here, but there is in the evidence positive showing that what the defendant does is the procedure disclosed in the Sargent article, the procedure as practiced by the Westinghouse Company and distinguished from Fink by the Court of Appeals, and it is the procedure practiced by the General Motors Company in 1924 and 1925 and 1926, prior to the Fink patent being granted, and really prior to it being applied for at all, and also the practice that was followed by Udy during 1922 and 1923 up to November, when he made the exact invention that is claimed in the claim of the patent in suit that we are charged to infringe, and Mr. Clark has so well outlined to you in his remarks.

The first question is whether defendants' chromium plating process is like Sargent. Sargent's article was published in 1920, and the Court of Appeals said of him in the former suit on this patent:

"His results were the cue to whatever else was done until Fink completed his work, and to Fink's work as well."

Sargent, then, was the cue to everything that was done including whatever Fink did.

It appears in this record, — and I simply mention it as an incidental fact in the case, that it was admitted by Fink himself under cross-examination at page 1853 of the record that plaintiff has Sargent in its employ. Fink could not say what, if anything, Sargent was doing for the plaintiff, but the plaintiff has him closed up, I suppose by the persuasive influence of a retainer, but we have the Sargent article.

I am surprised, to put it mildly, to have my brother on the other side say not once, but I guess a dozen times in their brief, and again to repeat it orally here, that there was no such thing known or recognized in the art as a "Sargent formula." I had supposed that there would be no question whatever but that they would attribute and admit the proper attribution to Sargent of a formula for a chromium plating bath consisting of 245 grams of chromic acid and three grams of chromium sulphate to each liter of water. They deny that there is such a thing, and against their denial I appeal to Dr. Fink, because in September 1923 with his own lips, (whose utterance I suppose the plaintiff would claim to be sacred) he read at a meeting of the American Electro Chemical Society at Dayton, Ohio, an article prepared by a pupil of his, Mr. Schwartz.— the ubiquitous Mr. Schwartz, who has been so much in this case, in the plaintiff's behalf, — and in that article which is in evidence in this case, but for convenience I read from the volume of exhibits in the former case, it is said:

"We next tried out the solution recommended by G. J. Sargent, 245 grams per liter of chromic acid plus 3 grams per liter of $Cr_2(SO_4)3$. A bright crystalline deposit was obtained which proved satisfactory in all respects."

If those sacred lips assert that Mr Sargent was the "daddy" of that formula, far be it from any of us poor lawyers, even under the plaintiff's retainer, to say that the art recognized that as the Sargent formula.

Let me remind your Honor how it came to be known as the Sargent formula. He wrote this long paper in 1920 and published it, and as the Court of Appeals said, that became the cue to whatever else was done thereafter, including what was done by Fink himself.

After describing in detail a number of different formulae, that is, different relative proportions of chromic acid and chromium sulphate, and various temperatures of the baths, and various concentrations of the chromic acid in the water, he came to a summation in this article in which he said:

"Very good deposits of chromium have been obtained from chromic acid solutions containing small amounts of chromic sulphate. A deposit one-half inch thick" — a witness in the case has said that that must have taken, I think, a thousand hours of continuous operation of a single bath to get it half an inch thick —

"has been obtained from a plating solution containing 24.5 per cent. CrO_3 and .3 per cent. $Cr_2(SO_4)3$ at a temperature of 20 degrees C. with the cathode current density of 10 amperes per square decimeter."

Those figures given in percentages there, are admitted to be 245 grams of chromic acid and 3 grams of chromium sulphate per liter of water. That is where the art started with Sargent, and over and over again in the literature, while I have sat here today after this last denial that there was such a thing as a Sargent formula was made by Mr. Scull, I took a few minutes among the exhibits in the case, and I find these four others.

Pierce's United States patent No. 1,545,196, speaks of Sargent's solution.

Yngve's patent No. 1,570,420, uses these words: "Using Sargent solution of 245 grams per liter of chromic acid and 3 grams per liter of chromium sulphate."

King's patent No. 1,582,407, "Sargent solution consists of 100 grams chromic acid and 3.5 grams of chromium sulphate per liter."

VanHeuser, a German, in an article in 1922 which is in evidence here, says: "Operating according to Sargent's bath recipe, one liter of water, 245 grams chromic acid, 3 grams chromium sulphate."

I appeal to the literature against the unwarranted statements of my adversary when they deny that there was such a thing as a Sargent formula.

The art generally apparently took the Sargent formula to be that which he recommended in the summary of his article as the one in which he had gotten the deposit of chromium one-half inch thick from his bath.

If your Honor please, I am not a chemist or the son of a chemist, but it does seem to me that if anybody at any time, given these instructions, shall take a liter of water and put 245 grams of chromic acid and 3 grams of chromium sulphate in it, and begin to plate, and continues to plate, that he is doing what Sargent told him, and nobody could attack him on any after-acquired

knowledge based upon the theory that there is in that bath some recondite action that produces or requires the determination of the amount of trivalent chromium or anything else in the bath.

The General Motors Company, for example, going back to about the beginning of 1925, practically a year before this patent in suit was applied for, at the Olds plant in Michigan, made up a bath according to that Sargent formula and began to plate, and they got so that by July of 1925, — now we are still six months ahead of Fink — with nothing before them except their native common sense, their experiences in plating, and the Sargent formula, they began to plate the exposed parts of the Olds car.

One of those very early cars, itself sold to the Chief of the Fire Department up in Michigan, and who brought it on here and testified about it, and your Honor and the experts and counsel on both sides went outside and saw it adjacent to the Court House here, he proved that he bought, and we proved that General Motors sold as of October 1925, that particular car, and the Chief said it had never been replated, and there it was, eight or nine years old, plated according to the Sargent formula, and still in as good condition as any of the new plated articles that had been produced in the case.

So the General Motors developed this on the basis of the Sargent formula, and they did just what the Court of Appeals said was the commonest thing in the art. When you make up a plating bath, (and we proved it independently to be the commonest thing for 20 or 25 years back) when you make up a plating bath and begin to plate with it, you periodically analyze it to see if it is up to the original formula, and if it is not, you add what it needs, and the General Motors added water, as that was needed, chromic acid as that was needed, and chromium sulphate as that was needed.

My brethren on the other side advance this most extraordinary theory. Starting with the premise that all the experts on all sides admit in this case that the only way you can determine how much chromium sulphate there is in a particular solution, is to analyze for the SO_4, and when you find out how much there is of that, figure it out by arithmetic how much that means in chromium sulphate, and then the managers of the bath would add to their bath if it required any addition, such chromium sulphate as was required to make it to the original strength.

That, the Court of Appeals in its Opinion said, was the common thing in the art to analyze and add to a bath in order to keep it up to its optimum or original formula, and that is all that either of these defendants is charged by the plaintiff with having done.

But they make what I suggested a moment ago was the most extraordinary argument in that connection. They say that because Mr. Fink has told it to the world, that it is not chromium sulphate as such, but SO_4, that is the controlling thing in that bath, that therefore the intent and purpose must be attributed to the chemists of the defendant to practice the Fink invention because he has spoken of the importance of SO_4 and not to fulfill the Sargent formula with which alone they were dealing in the first place and are dealing now.

It seems to me, if your Honor please, it is as though a common cook or a housewife in any house seeing a formula in an old cook book, whereby she is to add, we will say, so much yeast to a formula, is to be held as an infringer of a patent which deals with some unexpected action of the enzymes that give yeast its activating property in respect of food stuffs; a matter about which she, the cook, is as ignorant as I am; but because somebody has gotten up a theory which may be perfectly correct as to the activity of enzymes in a yeast, that therefore a cook following an old formula must infringe this late patent because she intended to get that particular activity of the enzymes about which she knew nothing at all.

Here the plaintiff is in this position: It can not deny for a moment this 245 to 3 formula as existing in Sargent. It can not deny for a moment that the defendants made their original solution according to that and are making their additions to bring it back to that. Those are the facts that they themselves elicited from these witnesses and they have nothing else to offer.

But they call the great Dr. Stevenson to say that something takes place in that bath of the New Departure or the bath of the Bassick Company which he denominates, as a matter of theory, the creation of trivalent chromium which to his mind tends to show that what the defendants are doing is to keep their eye on the SO_4 radical as such, and not to keep their eye on what all three of these intelligent and honorable witnesses said they were keeping their eye on, which was the amount of chromium sulphate which they would add to that bath in each case wherever it were necessary, in order to bring it up to the strength set out for the Sargent formula.

That, it seems to me, makes the question of infringement here, to put it most favorably to the plaintiff, a matter of the mental reaction of these individuals who are acting as employees for the defendant, and that being so, the burden still remains on the plaintiff to show what that mental reaction is, and it has not carried that burden at any rate.

If the Court please, that whole aspect of the plaintiff's argument seems to me to border on the ridiculous, and however I may feel about the strength of it, the fact yet remains that the plaintiff has not carried the burden of showing that what we do, that is obviously the same as Sargent proposed, is nevertheless because of some mental condition that is assumed to exist in the minds of those who carry on this process for the defendant, as intentional violation of the Fink patent in suit.

I think that however you put this proposition, on the issue of infringement, the result is the same. Either it is clear that what the defendants do is what they suppose they are doing, and that is following exactly the Sargent formula or else the plaintiff has failed to show that they have done it with the intention of following the so-called Fink practice.

If the Court please, the Court of Appeals in the former case had this very sort of thing before it with respect to the Westinghouse prior use because there the Westinghouse prior use as a fact, and as a date, was proved, and it took place in 1924 and the Court of Appeals refused to award to Fink the date of May 1924 which he claimed, and so they had to consider this Westinghouse prior use.

Before they got to that, however, and on page 916 of the 60 Federal Reporter, they were dealing with what was Fink's contribution and what was Sargent's, and they come at the bottom of the first column there at page 916 to the statement that, "Chromic sulphate contained the radical, the sulphuric acid and the chromic acid which combined to form chromic sulphate also contained it, but Sargent did not intimate that the radical alone needed to be controlled."

And then Schwartz did something, but still there was no suggestion that it was not necessary to use chromic sulphate.

And so we come to the middle of the righthand column on page 916:

> "Fink claims to have reached it in the spring of 1924. We need not decide whether that is a right date or a year later for nothing of consequence intervened as we shall show."

Then they come to, turning over the next page at page 917, they then come to Westinghouse on the righthand column at the top:

> "Piersol took up chromium plating in the Westinghouse Works at Pittsburgh in the spring of 1924. He also followed Sargent and Schwartz and in May 1924 filed an application using a ratio of 2 to 400 of chromic acid to 3 of chromic sulphate."

One of these, and I think both, come under Fink's limits.

> "He did not then know of the sulphate in the commercial chromic acid, but learned to count with it in September of that year. Thereafter he returned to the sellers all chromic acid which had more than one-fifth of 1 per cent. To what he kept he added chromic sulphate in what he considered the proper proportions. The working cards do show that the sulphate radical was calculated, but it was by way of computing chromic sulphate, which alone, in common with Sargent, he thought important."

Your Honor sees that the Westinghouse people did analyze for the sulphate radical. It was calculated. That is the only way they could analyze for

SO_4, but it was by way of computing chromic sulphate. All these witnesses whom the plaintiff examined as to the defendants' doings, say that that was what they analyzed for in order to compute chromic sulphate and bring it up to the formula.

And they are not guessing about that, if your Honor please, because it was all derived from the work initiated by the General Motors at the Olds plant early in 1925 before Fink had applied for his patent, and only more than a year before his patent was issued, and nothing was derived from Fink by the people at the General Motors Olds plant, but all came from the Sargent article.

That has just been continued on down in this District by the New Departure which is owned not in whole, but in part, by General Motors, and by the Bassick Company, who went to General Motors as the evidence shows after having tried to get the plaintiff or one of its licensees to plate some difficult parts for them, and the plaintiff being unable to do so, they turned to General Motors which seemed to be more successful in that regard, and got it to plate them, and to put in a plating plant for it.

So that there is a criterion of the scope of the patent in suit that definitely and particularly excludes these defendants.

If your Honor will turn to this last printed effusion from the plaintiff, the little brief, plaintiff's rejoinder to defendants' reply brief, and turn over to page 21, — because I want to say in all seriousness, if your Honor please, that what I am now going to call your attention to is typical of an almost infinite number of places where the plaintiff has apparently with complete deliberation so garbled what it puts into quotation marks, as to tend entirely to mislead your Honor or any other reader as to the truth of what it is purporting to convey.

On this page 21, on the very point I am arguing, turning now to the matter of regulation, "Defendants' reply brief, page 39, admits that," and then they quote from our reply brief.

> "The defendants' normal procedure was to analyze the bath periodically for the chromic acid content and for the SO_4."

Then they go on with their comment:

> "We agree with this."

Let us see what we did say. I will read what is in our reply brief at page 39:

> "The defendants' normal procedure was to analyze the bath periodically for the chromic acid content and for" — there is no "the" in our text — "and for SO_4" — going right on without a pause in our brief — "and for SO_4 for calculation of the $Cr_2(SO_4)3$ content and to add chromic acid and $Cr_2(SO_4)3$ when required to restore the bath to the Sargent formula."

If your Honor please, what they say is an admission was in fact an assertion of a fact, that is fully established as I have explained to your Honor by the evidence of the witnesses called by the plaintiff, and nowhere contradicted by any other witness whom they called, and they have the effrontery to say that we admit what they put into quotation marks in their brief.

That I regard as a typical sample of garbling throughout all these three briefs that makes me suggest to your Honor that if you take any statement of quotation there, you should not do so until you have verified it by the original, whether it be from a Court's Opinion or from one of our briefs or from the record.

So I say that what defendants have done that is charged to infringe here, is exactly what is in the Sargent article, and exactly what Sargent said back in 1920 he had used to get a deposit a half inch thick, and he gives in that single sentence the percentages, the temperatures of the bath and the current density, all of which are substantially or identically what we do; and moreover, it is the very bath which in the Schwartz article that Fink himself read in September 1923, months before he even asserts he made this invention, had been tried out by Schwartz and had resulted in a bright crystalline deposit which proved satisfactory in all respects.

If the Court please, the invention as defined by the Court of Appeals lay altogether in the ascertainment by Fink that the acid radical was the thing to be controlled, and so the improvement goes to the proper way to make the

solution by controlling the sulphate or acid radical within the limits given of 50 chromic acid to 1 of the acid radical up to 250 of chromic acid to 1 of the acid radical.

The Court of Appeals has said that the subsequent maintenance of the bath was not a part of the invention, but the commonest practice of the plating art, and Willard testifies to that being the case, and Stevenson had to admit it, as he did many things, with much reluctance after having been chased into the hole.

There is one other aspect of the invention, and I mentioned it a few moments ago, and I want to dwell upon it a little further, and that is as to the hydrogen film. There is a most, to me, horrentous paragraph running from line 99 of page 1 of the specification of the patent, almost to the bottom of the next column, that deals with this hydrogen film. It apparently was made a subject of great mystery in the former case, but falls out here because we are not charged with infringing those claims that have the hydrogen film of such hickness that something can not be done in it, and it became a great relief to me, if your Honor please, to find out that the evidence in the case developed that there was no mystery whatever about this hydrogen film, that it was just a phenomenon that could not be avoided, and I think I could put the thing accurately, and in very simple language.

As I understand, in any electro-plating bath, no matter what it is, in which there is by dissociation or electrolysis of the bath, oxygen given up, and also hydrogen given off, by a law of nature that is far more immutable than the laws of the Medes and Persians. The oxygen goes to the positive pole or the anode, and the hydrogen goes to the negative pole or cathode, and no power on earth can prevent the hydrogen from going to the cathode. There it bubbles up out of the solution and into the air, and that is the beginning and end of all this talk in the patent about this film.

So that that may be set aside, and we then come to an aspect of the Fink patent which is now so clearly proved as to be beyond all doubt, that is to say, its specification and consequently its claims are erroneous to a degree unprecedented in my experience, unless Fink is a charleton and not a scientist, as he pretends to be.

In a single sentence, and there is only one that really describes what his catalyzer is to be, or to consist of, — and let me pause there for a moment to say that the Statute cast upon Fink the inescapable duty of setting forth in his patent the best known way, which included the best known substances, to him, of carrying it out, and on all his own evidence and on all the evidence of Eldridge and the other students or young men whom he had in his plant there, or in his laboratory there.

> "Chromium sulphate was the one catalyzer that had stood the test, and that was in the solution No. 60 which my brother said in a triumphant tone, was a solution that had lasted from 1924 in the spring until this very day, and yet chromium sulphate as a catalyzer is not mentioned in the patent in suit at all."

Instead this one sentence which describes what the catalyzer may be has more errors in it than in a college graduate's examination, if he gets no mark at all. He says,

> "Substances which I find available as catalytic agents, and which remain stable, are acids and bases having a sulphate radical."

They admit that bases is wrong and they claim that it should be salt.

> "Acids and bases" — again a mistake — "having a fluoride radical; acids and bases which have a phosphate radical; acids and bases which have a borate radical."

Mr. Clark read to your Honor what Stevenson said in the former case and what he had to admit here was totally in error and which undoubtedly misled your Honor as my brother Clark showed, and misled the Court of Appeals on the very points that were of supreme importance, but I want to show your Honor as to this phosphate radical that Fink himself had tried it and found it would not plate before he applied for this patent, and so he with the utmost deliberation of intent was testifying publicly in this specification and Eldridge

in his cross-examination, beginning at page 1853, had his attention called to a card 39, dated February 5, 1924, in which so much chromic acid per liter with 100 c.c. of phosphoric acid per liter were run on a temperature, and that the card said, "No plating was obtained," and he admits that that meant that they got no chromium plating whatever, and that the card says "dry less phosphoric acid," and he was then asked:

"Did you ever to your knowledge, based on your note book entries, obtain any chromium plating when you used chromic acid with phosphoric acid as the sole additional agent?

A. "No."

And so it went. Never had they gotten the slightest success with phosphoric acid which would be an acid having a phosphate radical, and of course they could not with a base because they say that is wrong.

So that having demonstrated in their own laboratories that the phosphate radical would not work, they put it in the patent that it would work. There we have in a single sentence, when you count in the borate radical too, and the only sentence that defines what may be used as catalytic agents, six separate and distinct errors, and the claims, every one of them is drawn in such language as to include every one of these things, whether correct or incorrect.

I say on that showing alone, it was concealed in the other case by Stevenson's assertion to your Honor that he had plated with a phosphate and he had plated with borate, that he deceived this Court and deceived the Court of Appeals and the plaintiff must have known it while the deceit was going on, whereas in this case it was shown not alone that the patent was in error as to phosphate and borate, but that Fink himself knew it was in error because he had tried it and failed with the phosphate. So say that no favor should be given to the patent under circumstances of that sort, but that it is invalid.

There is another thing that I want to call to your Honor's attention. A large number of witnesses was called by the defendant either on the trial or depositions before the trial to show the great number of different difficulties that were encountered by Fink himself and by his licensee in attempting to chromium plate, notwithstanding that this patent is supposed to be for a complete and perfect chromium plating process.

There was Siebert who was a plater for the Chromium Corporation of America; Crowder who was at the head of Waterbury plant of Fink's company; Farr who was superintendent of Manning-Bowman & Company, a licensee of Fink's company; Raeburn who was the foreman and superintendent of the Mattituck Company, a licensee; and Fielding, President of the Mattituck Company, and Brunell, the largest job plater in the world, who was a licensee, and there was a deposition of Morton, and in part all this was confirmed by Burr, an employee of Fink, and who had to admit that at the Waterbury plant of Fink's company, they had to dump ten baths which would not plate commercially.

I am not arguing this point on the theory that that makes the patent invalid, but to bring out two things, and one is that the solution itself is not the solution of all the difficulties. The difficulties with plating with chromium began after the solution was obtained and continued for a very long time and continues to this day, and I want to read to your Honor on this point what those difficulties are. There have to be special cleaning methods, combinations of undercoatings to get better adhesion of the nickel to prevent peeling, peculiar buffing compounds, special racks to hold the devices, non-corrodible tanks, and one thing or another, and I will not go all through this, but I want to make my second point, and I will make it out of my adversary's reply to the defendants' brief at the bottom of page 7.

There is a long footnote in there dealing with these difficulties of the plaintiff and its licensees, and about the middle of that footnote at the bottom of page 7, that is, of the plaintiff's reply to the defendants' brief, at the bottom of page 7, about the middle of that long footnote,

"The significant thing is, that in all cases, the troubles of which defendants' witnesses made so much were not attributable to the Fink process."

Let us take that, and properly understood, I agree with it. It means of

course, as I said a moment ago, that the process is not the solution of all the difficulties. All these things arose in attempting to apply it, but if your Honor please, when they brought out or we brought out from the books that exactly the same sort of difficulties were encountered by Udy when he practiced what is identical with the Fink patent, and the Manhattan Company encountered the same difficulties, the plaintiff throughout all of these three briefs, aggregating 250 pages or so, insists that in the case of Udy and Manhattan, the encountering of these difficulties showed that they had not gotten a proper solution. They say what is sauce for the goose is poison for the gander. I say that it must be alike in both cases.

Just one word, and then I am going to stop, about this man Stevenson who tried to justify his statement in the former case to your Honor, that if you had a proper — his explanation ultimately was that if you had enough chromium sulphate in the bath, you might have a little phosphoric acid there, and still do commercial plating, and he made the same statement to explain what he had said before as to the borate.

I simply want to enforce the point that Mr. Clark made on that by reminding your Honor of the man who was indicted for wrongly marking his product as rabbit sausages, and he defended upon the ground that they were fifty-fifty rabbit — one horse to one rabbit.

That is the best we can do for Mr. Stevenson except to say that when the question was put directly at him, did he want all of the opinions he had expressed in this case to be judged by the standard of that particular incident, he hesitated and choked on that tough question, and finally said, "Yes," to it.

I thank your Honor for your attention.

REPLY ARGUMENT ON BEHALF OF PLAINTIFF.

Mr. Scull: May I have three minutes?

The Court: Go ahead.

Mr. Scull: As to Mr. Gifford's not having been called as a witness, I just wanted to explain the situation. I do not want to give your Honor the impression that we are imposing Mr. Gifford's decision in the Udy-Fink Interferences on you, of course. It has nothing to do with that. As a matter of fact we never would have raised any question at all or attempted to put any evidence in as to Mr. Gifford's part in that if it had not been for the loose charges of a conspiracy, and almost, I was going to say, fraud, which was bandied here at the trial.

As to these papers we were called on to produce. Mr. Clark called on me as representing the plaintiff to produce certain papers. I found that the client did not have them. So far as I knew they never did have them. All of these papers, so far as I know, have remained in the possession of his employer, the United Carbon, or the Electro-Metallurgical Company, and I assume that when Mr. Beckett produced what he had, that he produced all that company had. I do not know of anything that I could prove in that matter.

I think perhaps your Honor caught the point because Mr. Cooper afterwards read a part of the Court of Appeals decision which showed clearly what the fact was. He first said that the Court of Appeals refused to award Fink the date of invention of May 1924. Later on he did read in connection with something else what was the fact, that the Court said that they need not decide in that case, so that so far as the date of invention is concerned, it is entirely an open question even now.

One thing which I tried to follow, and I must confess I did not succeed, and that was what Mr. Cooper was talking about when he was discussing the claims that are in issue here and the claims in issue in the *International* suit.

Since I have picked out the claims to put in issue here, to simplify the thing, I cut them down from what they were in the *International* case, and I thought at first, when he was talking, that I must have slipped somewhere and put in issue here in this suit some claim that was not in issue in the *International* suit. I have checked it up and I find from your Honor's Opinion and from the claims in issue here, that every claim which is in issue here was in issue in the *International* case.

I can not see how there can be any difference in the conclusion as to infringement.

The last thing of all, and there are two, and they go directly to me, I suppose. One of them I suppose I can treat lightly. I would treat them lightly coming from most anybody except the elder brother that Mr. Cooper is, as to me, and his standing in the profession, but when he referred to the "unlawyer-like" proceeding of referring to the record in a previous case, that hurt, from him.

The only excuse I have is that that occurred in our reply brief after plaintiffs in their opening brief had referred to what was the proof of infringement in the *International* case. So that if I was "unlawyer-like" in referring to the records of this Court, I plead the fact that my brothers on the other side provided the aggravation.

Finally, the last thing I do personally resent seriously, and that is the inplication on the part of Mr. Cooper, based on the minutia of what he read to you, in which he said that you should check everything we said in our brief or quoted in our brief, either from their briefs or the records or anything else.

I thoroughly resent that. I do not think that either myself or our firm are quite accustomed to practicing that way, and I want to leave that with your Honor, that if that particular thing which Mr. Cooper read to you is sufficient justification for any sweeping, sneering statement of that sort, I would like to be advised.

Thank you.

The Court: On the exhibits, gentlemen, I will leave them all with you and if you will corral them and see that they are properly in order and then leave them either with my secretary or the Clerk, — I forgot about that, and I remember there were a lot of them.

Mr. Clark: We have our paper exhibits all well arranged.

Mr. Scull: As far as these large physical exhibits are concerned, I have no idea that your Honor is ever going to look at them.

The Court: No, I am not.

Mr. Scull: And consequently I suppose we can either take them away or store them here somewhere.

The Court: Yes.

Mr. Scull: We brought them here.

The Court: We have an exhibit room now in my office there where we store freight cars and similar things.

We will adjourn Court, Mr. Marshal.

(Whereupon at 5:15 o'clock p. m. the Arguments in the above-entitled matter, were closed.)

Plaintiff's Argument will be published in the May issue of the Review.

FREDERIC B. STEVENS DEAD

On March 1, Frederic Beckwith Stevens head of the firm of Frederic B. Stevens Inc. of Detroit, Mich. died suddenly. He was 78 years old and recently completed a half century in the plating and foundry equipment and supply industry.

Born and educated in Connecticut, he went to Detroit in 1883. He was successful in establishing a number of large plants and warehouses in important industrial centers in the U. S. and Canada.

The group of men who were associated with Mr. Stevens for many years in the management of the business announce that the same staff will carry on, and continue their service to the trade without interruption.

SOME PROBLEMS IN TECHNICAL CONTROL OF NICKEL PLATING PRODUCTION

F. A. Maurer (Read by George Hogaboom)

Read at Chicago 1933 Convention

WE manufacture electric flatirons at the Ontario plant of the Edison General Electric Appliance Company and have done so almost continuously for practically thirty years. The business was started in a small way by Mr. E. H. Richardson, the inventor of the Hotpoint electric iron, and it has had plenty of battles to fight to attain its present size. During that time we have learned a good deal about nickel plating. We have had serious losses due to "peeling" and various other ailments of nickel, but that was before we attempted any technical control over our production. Our workmen are highly skilled and very conscientious, but with all due respect to their skill and knowledge we could not run with the low ratio of loss we enjoy were it not for technical control.

By technical control I mean, of course, control over the quality and amount of all materials used in process, and speeds, temperatures and rates of doing work. Technical control is exceedingly important in the plating room. It is equally important in the foundry, polishing room, and glue room, as well as other departments if a large volume of quality work is to be turned out economically.

Our control starts in the foundry where the iron base for the flatiron is cast. It is a specialized job because of the steel-clad "calrod" heating element which is inserted against a chill and around which the molten metal must flow. The steel-clad calrod adds to the normal difficulty of getting sound castings because of the way it causes blow holes. A small amount of rust, grease or condensed moisture on this insert will cause a blow hole. Pig iron, foundry sand and coke are purchased on specification and analyzed. Every effort is made to produce a close-grained, easily machineable iron, which will take a high polish without showing the effect of wavy depressions caused by the tearing loose of large graphite flakes. An investigation is almost always under way, having as its object the minimizing of the well-known "orange peel" effect, resulting from this tearing away.

Porosity in the casting is bad because plating solutions get trapped under the nickel plate and, on first heating the iron,

are changed to steam with a violence which will lift the plate and show up as blisters. The iron which gives us best all around results analyzes: Silicon, 2.50%; Sulphur, 0.09%; Phosphorous, 0.40%; Manganese, 0.55%; Total Carbon, 3.30%; Graphitic Carbon, 2.80%; Combined Carbon, 0.50%.

Other metal parts are principally of cold rolled steel which is examined for temper, ductility and surface appearance. We now receive this interleaved with oiled paper because of our insistance upon freedom from scratches, which used to cause an undue amount of polishing. The steel must also be free of roll marks, pits, slag inclusions or other defects which would cause excessive polishing to remove. The steel is blanked and formed in the Press Room, using soluble oil where possible, otherwise a readily emulsifiable drawing oil.

After all preliminary grinding, trimming, milling, drilling and tapping is performed, bases and tops are received into the polishing room. Tops are roughed out on a 120 oil wheel, polished on rotary machines with 180 oil wheels and finished on 240 oil wheels. The artificial abrasive grains are given a screen test for fineness and the emery glue is tested for strength before they are accepted for use. The emery cake and grease stick used contain a readily saponifiable tallow to permit of easy cleaning later on.

Bases, or sole plates, are polished in two passes under the XLCR grinding machine. This machine has 10 wheels mounted in line, each wheel directly connected to its own motor. One 36, two 50's and one 60 mesh solid grinding wheels, then three 60's and three 90 mesh compressed canvas emery wheels are in the roughing lineup. The finishing routine is one 90, three 120's, four 220's and two 220 oil wheels.

We have found it very important not to overheat the castings, as by attempting to grind off too much with any one wheel. Numerous fine cracks will be developed in the surface if local overheating results from too fast a grinding operation and this makes a poor base for nickel plate.

All parts are now ready for the plating room. Smaller steel parts than tops get no polishing but are prepared for plating by burnishing and a separate routine followed. Tops and sole plates are first cleaned of grease in an electrolytic cleaner. This cleaner tank has been one of our biggest problems. The material in it must have a powerful cleansing action, since no preliminary soak is given the work, and it passes through the tank in one minute.

It must not discharge a caustic spray into the air because the operator works at one end loading it and he could not work under such conditions. The tank is not arranged for fume removal, hence no poisonous fumes, such as arise from sodium cyanide can be tolerated. Furthermore the tank is very seldom started in operation at a boiling temperature but usually when the solution has reached only a lukewarm condition. Under the limiting factors imposed by our operating conditions very few prepared cleaners will fill the bill and we have not to date succeeded in preparing a "home made" composition. We came very close with a composition containing trisodium phosphate, soda ash, sodium metasilicate and soap. This really did do good work but not as good as the proprietary cleaner, and although there would have been a nice saving, we have passed up the opportunity temporarily until further development produces a cleaner as good or better than the present.

The analysis of cleaners is a complicated job and one we do not attempt in a complete way. However, we can determine the total and active alkalinity, using standard acid solution, and by simple tests obtain a fairly good idea of the constituents, and a rough idea of their amount. The active alkali in a cleaner is represented by the amount of standard acid used to obtain a color change when phenolphthalein is used as indicator. Since phenolphthalein changes color, not at the exact neutral but while the solution is still alkaline, the total alkalinity must be determined by now adding methyl orange and running in more acid until a color change is obtained. Working in this way with various chemicals and prepared cleaners we have accumulated data which is gathered together in the appended table. By comparing the ratio of active to total alkali, and the value of the total alkali, of a prepared cleaner under consideration with corresponding values of the chemicals listed, one can judge if the cleaner is of a strong or mild nature and by aid of auxiliary tests get an idea of what it contains.

From the electrolytic cleaner tank the work is conveyed, after dips into water, acid, and water, to a copper strike solution. We prize this solution very highly and attribute a great deal of our success to it. It is composed of 1½ oz Sodium Cyanide, 1 oz Copper Cyanide, 1 oz Caustic Soda and 1 oz Trisodium Phosphate per gallon. Its function is first to make certain that the surface of the work is chemically clean, and second to deposit

copper on the surface at the exact moment when it is cleanest. Perfect adherence of plate to surface is thus assured. The solution cleans off any grease which by accident might escape removal in the electrolytic cleaner tank and the nascent hydrogen liberated at the surface of the work or cathode reduces to metal any slight oxide. It is a cheap means of insuring perfect adhesion. Our operator, who is responsible for quality, can tell by the appearance of the copper plate if his preliminary cleaning is right. He can tell much more surely, and quicker, than by examining for water break, and since he handles 1500 racks twice each day, each rack with 3 pieces, he must have a quick, sure, indication of the quality of his work. It is interesting to note that this man in transferring work from the end of the conveyor just described, where a water rinse is the last operation, to a nickel plating conveyor, handles in 7 hours a total weight of 40,000 lbs.

Nickel plating is done at 80-100 amperes per square foot, in a solution composed of 30-35 ounces nickel sulphate, 3-4 ounces nickel chloride, 3-4 ounces Boric Acid and 3-4 ounces magnesium sulphate. A plate approximately 0.001'' thick is applied to sole plates at a temperature of 124° in 12 minutes. Due to greater contact resistivity, steel tops require a higher voltage, a longer time and a higher temperature.

Nickel sulphate is a carrier of metallic nickel and nickel chloride is added to aid anode corrosion. Boric Acid is a buffer, preventing violent fluctuations of the acid pressure, or pH of the solution, while magnesium sulphate increases the conductivity of the solution. Due to the heavy plating out of nickel in this fast production unit, nickel sulphate must be added continually to keep up the metal content, since the anode efficiency is so low under these operating conditions that the anodes do not corrode nearly fast enough to supply the necessary metal. Nickel chloride, magnesium sulphate and Boric Acid need be added only in amount sufficient to replace the "drag out" loss.

Control of this tank is relatively simple. We have practically no trouble with pitting so long as metallic nickel and pH are maintained at the right point. Almost daily a pH and nickel test are taken. We use color comparators for both these tests for routine, but when we wish to know more exactly pH is checked by the quinhydrone electrode potentiometer method and nickel is titrated with sodium cyanide. The colorimetric method for pH gives values about 0.3 pH higher than the quinhydrone method.

Thus, when I tell you our pH runs usually 6.2-6.3 you may compare this with 5.8-6.0 as determined by the quinhydrone method. The colorimetric method for nickel is subject to more variation and may give values greater or less than that determined by sodium cyanide. It is rather difficult to match colors exactly on this set. However, for routine work, we feel it reliable enough. Occasionally a check is made of the chlorides with standard silver nitrate solution and of the magnesium by the method of precipitation with sodium ammonium phosphate. Boric acid is also determined, titrating with very weak sodium hydroxide in the presence of glycerin. Appended hereto is a table showing variations as mentioned.

Perhaps our next step in development will be to install a continuous filtration system on this hot tank. By being very careful we have managed to do without it so far but it looks like it will be possible to get a smoother plate from a tank so equipped and a smoother plate will mean less buffing and lowered costs.

Small steel stampings are prepared for plating by first soaking in alkali to remove drawing oil, then burnishing in maple lined barrels one foot in diameter at 60 RPM. It is interesting that the compound we use in the soak tank will also remove copper plate, and so all rework possible is soaked long enough to remove the copper. This is a remarkable property possessed by only one other alkali to our knowledge. Burnishing soap is "home made". Fifty gallons of soft soap containing 12 lbs. soap chips and 8 lbs. soda ash costs around 85 cents for material. One gallon of soft soap is used per barrel. At this low cost it is virtually impossible for a proprietary compound to compete, and it is also hard for competition from a quality standpoint.

Plating of small parts, after a preliminary cyanide copper flash, is done in still nickel tanks operated at room temperature. Time for plating on a maximum of 0.001″ is 2 hours and current density is about 10 amperes per sq. ft. The solution is composed of 10 oz nickel sulphate, 2-3 oz ammonium chloride, 2-4 oz magnesium sulphate and 2-3 oz Boric Acid per gallon.

An incident which occurred several years ago in connection with our still nickel tanks serves to illustrate perfectly the value of control of solutions. It had for some time become increasingly difficult to get good plate out of these still tanks, and finally it became utterly impossible. The department foreman called upon us to help him out of the difficulty. He did not know the compo-

sition of the solutions, as technical control was not in operation then, so we had to start in from the beginning.

He had noticed for some time that the anodes became coated over with fine green crystals. These crystals had cut down the flow of current until, at the time the anodes were completely covered, no current flowed. This, of course, was the reason no work could be plated. Relief had been afforded by scraping off these crystals but in a short while they reappeared.

Upon examination these crystals proved to be a double salt of nickel, similar to nickel ammonium sulphate. Analysis of the solution showed it was very high in salammoniac. The cause for the formation of the crystals then appeared quite clear. The salammoniac or ammonium chloride had perhaps reacted with part of the nickel sulphate, or magnesium sulphate present, forming ammonium sulphate and nickel, or magnesium chloride. This process, known as metathesis or interchange of ions, probably took place according to the equation

$$Ni SO_4^{=} + 2\ NH_4 CL^{-} = (NH4)_2SO4^{=} + Ni\ Cl_2^{=}$$

The ammonium sulphate then formed combined with part of the nickel sulphate present to form the double nickel compound, nickel ammonium sulphate according to the equation

$$NiSO_4 + (NH4)_2SO4 = NiSO4 \cdot (NH4)_2SO_4$$

This compound is only sparingly soluble and when more was formed than could stay in solution it crystallized upon the cold anode surfaces and was removed from solution. Since there was a huge excess of Salammoniac it was evident this process could go on for some time, more double salt being formed as fast as it was removed by crystallization.

To remedy the trouble, solution was taken out of each tank and temporarily stored. The solution so taken out was replaced by water. No more Salammoniac was added but the other bath constituents were added in sufficient amount to bring them to the correct concentration. Since the composition of the original solution was known by now, these removals and additions could all be calculated ahead and the exact weight added without guess work. As Salammoniac in the plating solution became depleted through "drag out" some of the temporarily stored solution was added and it was soon used up.

Since practically all of our work receives a final chromium plate over nickel, buffing is done with the object of producing as per-

fect a surface as possible for the chromium. The nickel is first cut down on wheels made up with 14" circular stitched, bleached muslin buffs, using a lime buffing composition. Buffing wheels are operated at a speed of 2300 RPM. After a thorough detail inspection, parts are returned to the buffing department, where they are held until ready to chrome plate. Just prior to chrome plating they are color buffed on wheels built up of 14" loose, unbleached, muslin buffs, interleaved with worn down loose buffs, and using a polishing rather than cutting composition. This operation is much faster than the cut down buffing. It is well known that chromium plate derives all its lustre from the undercoat, and for this reason we follow color buffing immediately with chrome plating. If any considerable period intervenes the colored nickel ware will lose in lustre due to surface oxidation and an inferior chrome plate is the result.

In the preceding paragraphs I have outlined the methods we employ to produce a suitable nickel base for chromium plate, on electric flatirons. The service is severe; the plate must withstand repeated heating and cooling with attendant expansion and contraction, without flaking off. The nickel must be applied in a very adherent, soft, ductile film, to withstand stresses effective during chromium plating, and stresses effective in service. Furthermore it must be applied economically. Expert supervision, careful, conscientious workmanship, and watchful technical control contribute to this end.

APPENDIX

Table 1. Alkalinity of various compounds

In the following table, one ounce per gallon solutions of the various compounds were made up. Ten cubic centimeter samples were then titrated with 0.5N Sulphuric Acid using as indicator, first phenolphthalein, then methyl orange. The active alkali is represented by the amount of acid used to effect a color change in the phenolphthalein and the total alkali is represented by the amount of acid used to effect a color change in phenolphthalein plus that additional amount needed to effect a color change in methyl orange, when the two indicators are added in succession, to the same sample. The values are empirical only and of value only for comparison.

Efficiency Methods

EDWARD H. TINGLEY

SOME EXECUTIVE PRINCIPLES FOR THE EXECUTIVE HIMSELF

By Edward H. Tingley,
Secretary, National Association of Foremen, Dayton, Ohio
"Reproduction forbidden without permission of the author"

ALFRED P. SLOAN, JR., President of General Motors, said: "The human problem is far more delicate and difficult to handle than any production problem or distribution problem or engineering problem or financial problem. Psychology and personality constitute at least fifty per cent of the material requisite for success as an executive. I have seen men with fine minds who failed to make their plans effective because they lacked understanding of how to work with people. In our business I should say that this psychological ability and personality mean seventy-five per cent of the necessary equipment. The ability to get people to work together is of the greatest importance. If people can get each other's point of view, disagreement as to policies and courses of action are usually slight."

Here is the head of one of the largest corporations who, out of his long experience says that "Men with fine minds failed because they lacked understanding of how to work with people" and he also says that this knowledge of people and the executive's personality mean 75% of the necessary equipment to be a good manager. So, in this article, we will discuss some executive principles for the executive himself—ideas which each one of us can use in making our job easier, more pleasant and more successful. There will be four of them and the first one is:

I. AN EXECUTIVE IS PAID FOR WHAT HE GETS DONE AS WELL AS FOR WHAT HE DOES.

More men have failed to grow in executive capacity because of working too much and thinking too little than from thinking too much and working too little. Some department heads are so busy doing detail work themselves that they take little time to think out ways and means whereby they could use others to help them in their work.

In using the abilities of others to get work done, the following analysis is helpful:

FIRST. Decide definitely what is needed. Avoid asking subordinates to keep records or to do work that is not to be used. Such action will lower their regard for the important work to be done. They will get careless and disgusted with wasting their time on unimportant detail. Work should be planned in advance so that no time is wasted. All work should be considered valuable or else it should not be done.

SECOND. Clearly explain what is wanted. Frequently the boss will think out a problem and plan it in detail for some time. He sees clearly what is to be done. Then he calls in one of the men and in five or ten minutes attempts to tell him what he, the boss, has taken days to think through. It is so clear in his own mind that he expects everyone else to see it in the same way. This is a wrong conclusion and in many cases causes trouble for both parties.

Later the subordinate is blamed for not doing what he should, but the executive is the one to be blamed. The average employee is no mind reader—and we should not expect him to be. So to save time in the future clearly explain what is to be done and avoid arguments.

THIRD. Tell the worker truthfully when the information is wanted or the shipment is to be made, etc. Do not tell him to have something ready by noon when 4:00 P.M. is just as satisfactory. If you are taking a five o'clock train, do not say you are leaving right after lunch and expect the worker to drop everything to get your work out four hours ahead of time. He soon learns that the boss does not mean what he says and gets careless and begins to delay all his work. And then when something real important must be out at a certain time, the executive has to keep checking up to avoid being late.

Be exact as to time and place, and, then as time goes on, the practice will bring all your subordinates into a better regard for all requests.

FOURTH. Do not fuss and worry. Fussing and worrying is contagious and soon the whole department gets upset. Efficiency drops and confusion is apparent at all times. Be orderly —plan your work and expect obedience.

The executive's job is to keep others busy. He is paid for what he gets done and not merely for what he does. He is rated as a good executive in comparison with his ability to multiply himself through others.

II. AN EXECUTIVE SHOULD NEVER BE TOO BUSY TO FIND OUT HOW TO BECOME LESS BUSY.

Each day the executive must handle four things:

A. The Regular
B. The Irregular
C. The Special
D. The Creative.

The amount of time you give to each is indicative of your ability as an executive.

The Regular duties should be delegated so that they will require very little time.

The Irregular things must come to the executive for his job is to straighten out tangles. The better he does this—working himself out of a job—the cleverer executive he is. He keeps himself free from too much detail—handles the irregular items promptly—leaving time for

The Special work that higher-up executives must pass on. This Special work seems to take all the spare time of many executives and should be studied to see if much of it cannot be delegated or avoided by better system or advanced planning.

The Creative work is the most important of all and usually gets the least attention. The other items take up so much of the day that when a little leisure comes along the mind is not ready to do any constructive planning. Creative work is that which looks to improvements, savings, better working conditions, improved equipment, etc.

When you say you are *too busy* to do any of this type of thinking, there is but one inference and that is, your methods of handling the regular duties are so poor that you have no time left. Being too busy has kept many a department head from receiving, from above, responsibilities which would broaden his scope, increase his value to the company and place him in line for promotion.

There is a great difference between being busy and being hurried. The boss who is behind in his work and his work is hustling him is in a difficult situation. Get busy and hustle your work so you will not be hurried all day long.

Many waste their time and exhaust their energy in excited action. Fear, worry, rush and hurry are not symptoms of real accomplishment. Shouting and running about is not always productive of results. The executive should take time to get

at the cause of all difficulties so as to avoid their reoccurrence.

To get very far in the business world, the executive must realize this important fact. There is no past, there is no future—all we have is the present. We do not possess the past—it's gone. We cannot possess the future. It isn't here. Our only possession is *now* and we should make the most of it.

The best executive makes use of the fleeting moment—doing one thing at a time and finishing it. He tackles another and disposes of it. He is not hurried by the pile of work ahead of him—he drives on it in the present and gets a great deal done.

An executive who is too busy to do important things or too busy to take on additional responsibilities lacks executive ability, the power to delegate. Take time today to find out how to become less busy tomorrow.

III. AN EXECUTIVE IS GOOD TO THE EXTENT THAT HE HAS THE ABILITY TO RECOGNIZE, ACCEPT AND ACT ON GOOD ADVICE.

Do you know what holds most people back in life? What keeps them from progressing and advancing? Two things!

They resist the new.

They resent criticism.

Progress in industry and life comes from change. New methods, new products, new ideas supercede the old. And the new is a real improvement over the old. At first only a few see any good in the new ideas and the majority say "leave well enough alone." The minority always has to prod on the majority, if the world is to progress.

People resist the new—it makes them change their habits, it makes them think and that disturbs a lot of folks. And sometimes the so-called "experts"—who are supposed to know a lot about the subject—will decide that it cannot be done. They are not open-minded to new ideas and often we have to take a man who knows nothing about the problem, but who is willing to tackle the job, to work out the new ideas.

And what a lot of things there is to know in the modern manufacturing plant. Many trades and processes are required and foremen must be experts. But the day has passed when it is possible for any one man to be fully informed on everything that pertains to the work of his department. Trade societies provide additional education and staff men assist the foreman to solve his problems.

However many foremen and executives cover up their lack of knowledge by resenting new ideas or advice from others. They resent criticism. It hurts to be told that we are making a mistake. Especially the man at the head of a department feels that he should know all about his department and it affects his pride to have other men tell him about better ways to work. A large factory has been using a sign that just covers this point.

"The people who help me most are those who tell me
when I am wrong".

Would you be satisfied to post such a sign in your office and welcome criticism and suggestions? Will you try it and see?

I have often thought that if we could but assemble all the intelligence in a factory we could solve any and every problem that arises. Many factories have gone in the hands of a receiver when the answer was perfectly well known to someone in the organization, but the facts were not given to the boss. Maybe the executives did not welcome suggestions or ask for criticisms.

One of the most helpful things that can be done in any factory is to get one foreman really wanting the criticism of another. And if we can get foremen to really want ideas for improvements from everybody and that they want them direct, we have taken a big step towards personal success.

Thomas A. Edison sums up the discussion in these words: "There is no truer test of a man's qualities for permanent success than the way he takes criticism. The little-minded man can't stand it. It pricks his egotism. He 'crawfishes.' He makes excuses. Then, when he finds that excuses won't take the place of results, he sulks and pouts. It never occurs to him that he might profit from the experience."

. Therefore an executive is good to the extent that he has the ability to recognize, accept and act on good advice.

IV. IT ISN'T WHAT A MAN STARTS: IT IS WHAT HE FINISHES THAT COUNTS.

A man may think that he has the ability to do several things at the same time, but not so. It is perfectly plain that a man can do but one thing at a time. He may be looking after four or ten or more things, but at no single instant is he doing more than one thing at a time. Until an executive realizes this, will he square away and rightly dispatch one thing at a time with orderly precision.

Handling too many items at the same time, creates confusion and the boss soon finds himself mentally and physically "shot." It isn't what a man starts—It is what he finishes, that counts.

You have heard men say: "I would have completed that job if—" or "I thought I could make it before five o'clock but—" or "It took me longer than I thought it would—" or "We would have shipped that order last night, but—"

The French started the Panama Canal and sunk barrels of money. Uncle Sam and Geothals finished the ditch, the water was turned in and the canal began to serve commerce; but not until the water was turned in, did the job count.

It matters little who starts a job, most of the credit will go to the man who finishes it.

It isn't time that we lack to finish a thing. No man has more time than any other man. It is the use we make of time, or rather the use that we fail to make of time, that holds us back. It is the taking things up mentally and laying them down—flirting with them instead of working with them, that takes time.

Are you a man of action or do some of the jobs you start die ere you finish them?

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The Abstract Section

EDWARD B. SANIGAR

THESE abstracts are mostly adapted, by permission, from "Chemical Abstracts", the references to that publication being given in the form — *C. A.*, **27,** 3402 (1933) *i. e.*, Chemical Abstracts Volume 27, column 3402 in the year 1933. The name appearing at the end of the abstract is that of the abstractor. Abbreviations for scientific journals are those used by "Chemical Abstracts" (see *C. A.* **25,** 6019 (1931)). E. B. S.

The deposition of chromium from solutions of chromic and chromous salts. CHARLES KASPER. *Bur. Standards J. Research* **11,** 515 (1933) (Research Paper No. 604).—Bright deposits at high efficiencies are obtained by maintaining a low concentration of hydrogen-ions and a high concentration of chromium-ions in the cathode film. Violet solutions of trivalent chromium, in which the green undissociated molecular ions are not formed, will not increase the efficiency. Experiemnts to show whether a tri-valent bath is comparable to the chromic acid bath were made as follows:— Chromic fluoborate, producing a violet bath, required a high c.d., produced uniform, bright deposits with difficulty and had a narrow plating range. A solution of potassium chromic sulfate ($KCr(SO_4)_2$), containing sodium sulfate and sulfuric acid also required a high c.d., had a narrow plating range and produced bright but pitted deposits. Prepared pure chromous sulfate ($CrSO_4$) containing sodium sulfate in the anode compartment, gave no better results. Complex chromium compounds, such as ammonium chromi-oxalate, gave still lower efficiencies, although the ammonium chromi-oxalate bath gave good deposits. The author's conclusions are: (a) simple tri-valent chromium baths yield poor deposits at low efficiencies. The bright plating range is exceedingly narrow; (b) Chromous baths give results which are similar to those of the tri-valent baths; (c) The use of complexes in order to solve the difficulties inherent in the tri-valent bath is unsound; (d) The chromic acid bath is inherently superior to solutions containing lower valence compounds.

E. B. S.

Black-finishing chromium-plated metal articles. U. S. patent No. 1,937,629. December 5, 1933. H. R. Carveth (to E. I. duPont de Nemours & Co.) Chromium plated articles are treated in a molten salt bath containing an alkali metal or alkaline earth metal cyanide, for example, in a bath formed from sodium cyanide 45%, sodium carbonate 35% and sodium chloride 20%.

C. A. **28,** 1014 (1934).

Protection of aluminum against corrosion. José Ma. Fernández-Ladreda. *Anales soc. españ. fiś. quím.* **31,** 776 (1933).—The best protection in moist atmosphere is obtained by anodic treatment in an aqueous bath containing crystalline sodium carbonate 125, sodium chromate 8, concentrated ammonia 25cc. per liter at 50-60° C. for 10 minutes.

C. A. **28,** 976 (1934). E. M. SYMMES.

Electrodeposition of aluminum from non-aqueous solutions. R. D. BLUE and F. C. MATHERS. *Trans. Electrochem. Soc.* **65,** (preprint) (1934).—Aluminum of high purity can be easily deposited in a bright, finely crystalline, adherent form from a solution made by dissolving metallic aluminum in ethyl bromide and benzene using aluminum bromide as a starter or catalyst. Toluene, xylene, beta-tetra-hydro-naphthalene, and kerosene may be substituted for benzene under certain conditions and ethyl chloride, methyl chloride, ethylene dichloride for ethyl bromide. The aluminum adheres well to platinum, copper, steel and cast-iron but not to magnesium or aluminum. The bath is best made by dissolving 30 gram of aluminum in 1cc. of bromine, 450cc. of ethyl bromide and 250cc. of benzene: the details of preparation are simple and easily carried out, but certain precautions are important. The baths maintain themselves well, the anode efficiency being 80% and the cathode efficiency being 60-70% if operated at the proper current or voltage. The c.d. should be about 8.4 amp. per square foot. The throwing power of the bath was found to be as high as 28 at high c.d. The bath is not especially expensive or difficult to prepare, does not deteriorate and can be operated indefinitely if moisture is excluded. The authors think that this bath can be operated commercially, but the cost will be greater than for aqueous baths. F. B. S.

Aluminum surfaces. French patent No. 750,391. August 9, 1933. Aluminum Colors Inc. Surfaces of aluminum or aluminum alloys are covered with a layer of oxide which is treated by a metal compound and an oxidising agent in the dissolved state to produce a metal oxide of a characteristic color in the said layer. *C. A.* **28,** 736 (1934).

Corrosion-resistant coatings on aluminum or its alloys. U. S. patent No. 1,936,058. November 21, 1933. A. JENNY and N. BUDILOFF (to Siemens and Halske A.-G.)—Articles of aluminum or its alloys are immersed in a saturated solution of chromic acid and an alternating current is passed between the articles through the solution. *C. A.* **28,** 736 (1934).

Protecting light metals. French patent No. 42,676. September 1, 1933. Siemens Elektro-Osmose G. m. b. H.—In forming protective coatings on aluminum or aluminum alloys, a layer of oxide on the co-operating electrode, and preferably also the protective coating on the articles, is obtained by using a saturated solution of chromic acid. The temperature is 40-60° C. and the voltage 40-60 volts during about 20 minutes. *C. A.* **28,** 717 (1934).

Coating aluminum. French patent No. 754,077. October 31, 1933. Aluminum Colors Inc.—Aluminum surfaces covered with oxide are dipped into a solution of a salt, for example, an acetate or sulfate of nickel or cobalt, whereby a practically insoluble precipitate is obtained. *C. A.* **28,** 1014 (1934).

The anodic behaviour of iron metals. K. Georgi *Korrosion u. Metallschutz* 9, 302 (1933). (Compare Monthly Rev. January 1934, p. 25. E.B.S.).—A theoretical discussion of the potential phenoma with iron, nickel, and cobalt anodes based on the assumption of adsorbed layers on the surface. *C. A.* **28,** 974 (1934). L. PESSEL.

The corrosion of zinc in chloride solutions. C. W. BORGMANN and U. R. EVANS. *Trans. Electrochem. Soc.* **65,** (preprint) (1934).—The corrosion of zinc was studied, in the cast and rolled conditions and in various degrees of purity, under conditions of partial immersion in potassium chloride solu-

tions, sea-water and distilled water. The results in potassium chloride solution show some striking differences to former experiments on wholly immersed zinc and to those on iron (wholly or partly immersed). The corrosion of the sheet specimens continues to rise with the concentration instead of falling off at high concentrations, as in cases where the corrosion rate is limited by "oxygen starvation". On the cast specimens, the absence of hydrogen evolution is a surprising feature. The results provide little hope of materially increasing the resistance of zinc to any of the liquids studied by eliminating or adding other metals, by protecting the cut edges or by avoiding abrasion of a rolled surface. *C. A.* **28,** 1006 (1934). C. G. FINK.

Local re-inforcing of electrodeposits, with special reference to silverware. RICHARD JUSTH. *Metallwaren-Ind. u. Galvano-Tech.* **31,** 403, 442, 461 (1933).—Practical methods are described with their patent numbers. *C. A.* **28,** 976 (1934). C. L. WILSON.

Silver-plating. French patent No. 750,476. August 11, 1933. A. TABARANT.—Copper and iron are silvered without external current in a liquid composed to two solutions A and B mixed together. A is obtained by dissolving sodium hyposulfite in water and adding silver bromide. B is obtained by adding a saturated solution of platinum chloride to water and then adding red potassium chromate. Decomposition of the final solution by light is prevented by adding a little silver blue called Borel. *C. A.* **28,** 736 (1934).

Dental alloys. French patent No. 753,292. October 12, 1933. STEFAN LOOS.—Each of the constituents of the desired alloy is applied successively one on another on a matrix in very thin layers and in number sufficient to form the desired thickness of plate. The outer layers are preferably of a precious metal. The metals are applied by electrolysis or by a pistol. *C. A.* **28,** 717 (1934).

Methods of controlling deposits of zinc and cadmium. J. BARY and P. ORLOWSKI. *Usine,* **42,** No. 40, 21 (1933).—Methods for comparing the electro-deposition of zinc and cadmium with respect to resistance against corrosion, and the industrial checking of thickness of deposits, are discussed. The Preece test for zinc (with 20% copper sulfate solution at 18° C.) gives proper indication of required thickness for corrosion resistance. For testing cadmium deposits a method is given depending on the time required to dissolve the coating by a solution of hydrochloric acid and antimony tri-chloride. (Cf. Monthly Rev. **20,** No. 1, 34 (Sept. 1933). E.B.S.) *C. A.* **28,** 713 (1934).

Coating objects with molybdenum. German patent No. 580,748. July 15, 1933. Patent-Treuhand-Ges. fur elektrische Glühlampen m.b.H. (Hans Wolff, inventor).—The objects are given a thin coating of a colloidal solution of a reducible molybdenum compound and then heated to above 900° C. in a reducing atmosphere. Colloidal molybdic oxide (MoO_3) obtained by heating crystallised ammonium molybdate ($(NH_4)_2MoO_4$) *in vacuo* is preferred. The resulting coating adheres strongly to the object. *C. A.* **28,** 1014 (1934).

Cleaning and disinfecting metal articles. U. S. patent No. 1,937,229. November 28, 1933. H. KANTOROWICZ. Articles of metal such as aluminum or other receptacles or utensils are treated with a solution containing hypochlorite, alkali metal silicate and caustic alkali. *C. A.* **28,** 1155 (1934).

ABSTRACTS FROM EDUCATIONAL COMMITTEE

T. F. SLATTERY, Chairman

ELECTROLYTIC CHROMIUM PRODUCTION FROM CHROMIC ACID BATHS CONTAINING FLUORIDE.

by E. Muller and O. Rossow. Z. f. Elektrochem., **38**, 883, 1932.

The authors present evidence to show that fluoride containing chromic acid baths have wider plating range than the sulphate containing bath at low temperatures. The data given is very meager but the point is proved for copper base metal. The data given is too meager to compare with the complete data in existence for the chromic acid bath with sulphate addition agents. The work is protected by U. S. Patent No. 1,844,751.

CHAS. KASPER.

Theory of Chromium Deposition *E. Liebreich—F. Elektrochem*—40, 73, 1934

The author brings forth evidence to show that perchlorate, phosphate and borates cannot be substituted for the sulphate in chromium deposition. He attempts to account for the action of the addition agent (sulphate) in terms of the solubities of chromium chromates in the acids of those radicals that are added. It is contended that the fact that the polarization curves do not move markedly when the addition agent (sulphate or fluoride) are added is indicative that any theory based on these ions perforating the cathode film is unsound.

CHAS. KASPER.

Anodes for Flouride containing Chromic Acid Baths

F. Elektrochem, 40, 14, 1934. *Erich Muller and Jou E. Vestdal*

When flouride is used either with or without sulphate in the chronic acid bath it may coat the anode with lead flouride. This condition sets in only after an anode has been allowed to stand idle in the solution. Passing a current of 2.5 amps/sq.dm. through the solution will partially remove this condition after thirty minutes and completely at the end of four hours. The use of lead-antimony or lead-bismuth alloy anodes tends to eliminate this effect. With 10% alloys it is cut down by a factor five and with 30% alloy by a factor which may be as high as eight. The operation with the high bismuth or antimony alloys is practically the same as that of fresh anodes. In these solutions the high antimony or bismuth lead alloy anodes are most favorable for keeping the trivalent chromium to a minimum.

CHAS. KASPER.

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IN 1917 and in 1929 Detroit Branch entertained you in Conventions, and now in this year of 1934, we again are indeed glad to welcome you all and assure you of at least as profitable and enjoyable time as you had at those other two Conventions.

NEED *of* PRACTICAL PAPERS

Will all Branch Societies please notify the Secretary of the Detroit Branch of all those in their Branches who will present or send a paper for our Convention program? There seems to be a need of practical papers from practical men.

Also exhibits of Plating with process given. These exhibits may be sent in care of the Statler Hotel and held for the Convention.

T. C. EICHSTAEDT, *Secretary-Treasurer*

DETROIT BRANCH

A regular meeting of the Detroit Branch, was held Friday evening, March 2nd, at 8:00 P. M. The meeting was called to order by the President, Joseph H. Hansjosten, in the Ivory Room, of the Statler Hotel, and a good attendance was present. Minutes of the previous meeting were read and approved. The following applicants were reported on by the Board of Managers and unanimously voted to membership as Associate Members:—Edw. Stanley Whithoff, 1116 Lakewood Ave., A. E. Greise, 1512 Twelfth Street, Richard D. Alsdorf, 3816 W. Euclid Ave.

A letter from Dr. Blum, Washington, D. C., announcing meeting of Joint Committee of A. E. S. and A. S. T. M., to be held in the Bureau of Standards, Washington, D. C., Thursday morning, March 8, at 10:00 A.M., was read and placed on file.

Reports of Committees: Mr. W. W. McCord, Chairman Finance Committee reported very good progress and expected to have Program closed by April 1st.

Mr. Chas. Eldridge, Chairman Program Committee, reported progress, but not as well pleased at not having received voluntary papers from the members of the Branch Societies. (Branch Societies please take note of this).

Mr. Geo. L. Nankervis then read a paper on Low Voltage Generators, which was well read, very interesting, and educational, and will no doubt be published in the Monthly Review later.

The Question Box was then conducted by Acting Librarian, B. F. Lewis, and the following questions were asked and answered:

1. *What are the advantages or disadvantages of a lead lined tank over a rubber lined tank for a low pH nickel bath?*

Answer: Rubber, being a non-conductor is considered distinctly superior to lead, regardless of pH.

2. *What is the best method of removing zinc from a die cast nickel solution?*

Answer: If a clean storage tank is available, the zinc can be precipitated out by heating the solution to 180°F or higher, and raising the pH as high as possible by adding a solution of caustic soda or sodium carbonate until some of the nickel is precipitated. The solution should then be thoroughly agitated for 30 minutes or more, preferably with air, then settled overnight and filtered. Loss of solution should then be compensated by additions of the various constituents, and the pH and temperature adjusted to operating conditions. If facilities for these operations are not available, it is probably cheaper to discard the solution.

Another method of removing the zinc, if sufficient time is available, is to lower the pH to about 2.0 and plate out on dummy cathodes. Some platers have found that a low current density seems to plate out the zinc faster than a high current density. This operation requires from 10 to 30 hours, depending on the quantity of zinc.

3. *Is it necessary to use antimonial lead for chrome tank lining, or is commercial lead satisfactory?*

Answer: The only advantage of

antimonial lead is the fact that being harder it is not so liable to become distorted.

4. *What are the relative merits of acid and alkaline tin baths?*

Answer: The alkaline bath has been studied and developed to a point where it is commercially practical. When research work now in progress on the acid bath is completed a better comparison can be made.

At our next meeting, to be held April 6th, in the same place, we will have for the speaker, Mr. George Hogaboom, who needs no introduction to the plating industries, as everyone knows he is full of information. We expect to have a very interesting as well as educational program.

We are inviting the Electro-Chemical members to attend this meeting, as well as all the members of the Job Plating, Enameling and Finishing Institute.

We are looking forward to a very large attendance.

Meeting adjourned at 10:00 P.M.

T. C. EICHSTAEDT, *Secretary-Treasurer*

CLEVELAND BRANCH

Cleveland Branch held its regular monthly meeting at Carter Hotel on Saturday, March 3rd, 1934, with President H. J. TerDoest in the chair. The minutes of previous meeting were read and approved. All communications were read and placed on file. Bill for Per Capita tax read and ordered paid. Our Librarian, Mr. Thompson, read a paper on the Fundamentals of Electro Plating.

There was not time for much discussion as adjournment was called for at 10:30 P.M. W. D. SCOTT, *Sec'y*

MILWAUKEE BRANCH

The regular meeting of Milwaukee Branch was held at Lipps' Hall, N. 3rd and W. Highland Ave., March 8, 1934. Meeting was called to order by President Paul Krause. A very good attendance of members being present, due to the interest taken in making our Smoker and Educational Session (Saturday, April 7), the best ever. The committee promised all a good time, and have arranged a very good program. FRANK J. MARX, *Sec'y*

CHICAGO BRANCH

The regular monthly meeting of the Chicago Branch was held March 10, 1934, at Atlantic Hotel. As the weather was very nice, we had a larger attendance than we have had for some time past, and there is no doubt but that it puts more interest into the meeting when the attendance is large.

Mr. G. Holmgren was elected an active member of Chicago Branch.

A very interesting paper on Stainless Steel and Chromium Plating was read by Mr. O. E. Servis. Also, a very interesting and instructive paper on "Some Laws of Good Work" was read by Mr. C. Thompkins.

The following questions were found in the question box:

1. *What is the formula of bright dip for die cast aluminum and also for sheet aluminum?*

Answer: Use an ordinary bright dip; dip in potash and then directly into the bright dip.

2. *Is there a way to finish Brass Casting to look like aluminum in a brush finish?*

Answer: Cadmium is closest to Aluminum.

3. *What causes my Chrome plated pieces when buffed to show buff scratches? Is the machine running too fast or too slow?*

Answer: Many suggestions offered—keep buff clean and not use too much composition at one time.

4. *What amount of carbonates is considered suitable in a brass solution at room temperature? If the amount in*

solution is too high, what is the best method in removing? If barium chloride is used, and some remains in solution, can harm result?

Answer: If carbonates get too high, it is harmful. Either freeze out or dilute solution to lower your carbonate.

5. *Is there any advantage in using Sodium Sulphate in a nickel barrel solution for plating brass, or will the solution for this purpose work better without this salt?*

Answer: 8 to 10 ounces And. Sodium Sulphate can be used to each gallon, but is of no particular advantage for plating brass parts in a barrel unless it has deep pockets to throw into.

6. *Has continuous filtration been used successfully in nickel plating solutions for a long period of time? The solution in mind has a pH. of* 5.8.

Answer: Yes. Very good results can be had by continuous filtration.

7. *What difficulties are likely to be encountered in brass plating solution if pieces are not thoroughly rinsed and nickel solution is allowed to carry over into brass solution. Will blistering, streaking or peeling be found in the following plate?*

Answer: Poor rinsing causes streaking and blistering and destroys your cyanide in the brass solution.

LOS ANGELES BRANCH

Minutes of the Los Angeles Branch, regular meeting held February 14th, 1934, at the Rosslyn Hotel. President M. D. Rynkofs presided. Minutes and financial report of the previous meeting were read and accepted. The secretary reported that A. J. Lupien had sent us $6.00 back dues and asked to be reinstated. The branch voted to reinstate him. The secretary was instructed to issue him a transfer to the Detroit Branch as per his request.

Mr. Rynkofs gave a talk on the benefits of the Society to the members. The meeting was then turned over to the Librarian. Samples of magnesium alloy were shown and methods of plating same were discussed. No one knew of any method of making a plate stick to them. The following questions were found in the question box:

1. *Can chrome steel or stainless steel be successfully chromium plated?*

Answer: Yes. Use the same solution you would use to do hard chromium plating. PLATE DIRECTLY ONTO THE STEEL.

2. *Is there a nickel solution that will plate satisfactorily on die castings without agitation?*

No one knew of one.

3. *Is there a silver oxidizing solution that will relieve easier than liver of sulphur?*

No one knew of one. It was suggested that the liver of sulphur solution be used weak and very hot.

4. *How can you plate bright brass on iron or steel by immersion?*

Answer: Make solution of 2 oz. copper sulphate, 2 oz. protochloride of tin and one gallon water. Place the article to be plated in this solution and stir until the desired color is obtained. EARL COFFIN, *Sec.-Treas.*

TORONTO BRANCH

Instead of our usual monthly meeting in Foresters' Hall, on Monday evening, February 26th, we assembled in one of the lecture rooms in the Mining Building of Toronto University, to hear Mr. A. H. Heatley, M. A., deliver a lecture on "Polarizations, Profitable and Otherwise." By means of specially prepared apparatus Mr. Heatley demonstrated anodic and cathodic polarization very clearly. His explanation of the phenomena of passivity was particularly interesting and instructive. During this portion of his talk Mr. Heatley used two large illuminated ammeters and various anodes. The effect of different chem-

icals of the chlorine group was shown. Prof. J. T. Burt-Gerraus also made clear the "How and Why" of what occurs in an electrolytic cell, by means of a lantern and miniature cells enlarged upon the screen. By using a styptic pencil he showed very plainly how our anodes become gradually smaller. This event was made possible by reason of the kindly interest of Prof. J. T. Burt-Gerraus who is always ready and willing to help Toronto Branch. A fair attendance, for a blustery winters night, greeted the speakers.

Next month we meet at 22 College Street. Don't forget J. Vallier's notice of motion. H. W. GRAHAM, *Secretary*

PHILADELPHIA BRANCH

Philadelphia Branch held its $1 dinner meeting on March 16th and while the attendance was not up to what we expected, still it was a very good meeting and Oliver J. Sizelove's "Question Box" and research report and also a short talk on a new acid tin bath went over fine, and all that was lacking was the attendance of some of our out of town members, for we know that you missed a good treat in this meeting, we hope you will be able to attend the next time.

The branch librarian was instructed to make use of the "Monthly Review Question Box" and the question for this month is: *What is the formula of the Klondike Gold Solution which was in use some thirty years ago, also the manipulation of the solution and the work for best and proper results?*

Read the Quaker City Platers Reminder for full details of our April 20th meeting at the Harrison Laboratory, U. of P. GEORGE GEHLING, *Librarian.*

WATERBURY BRANCH

The regular monthly meeting of Waterbury Branch was held Friday evening, March 9th, in Engineers Hall, President Tennant Elwin presiding. Lecture committee reported that arrangements had been completed for the appearance of Dr. Blum, on March 15th. Communication was received from T. C. Eichstaedt, secretary-treasurer of the Supreme Convention Committee asking the members to make an effort to present papers and exhibits at the Convention to be held in Detroit, during the month of June. As many of the members were not present at the meeting, it is hoped that when they read the Review, they will give this matter their earnest attention and make an effort to comply with the request. Members of Waterbury Branch, in the past, have contributed some excellent papers, and it is hoped that a repetition will occur at the coming convention. Exhibits are also desired, there being two classes, one for a showing, and the other for a prize, three prizes to be awarded in the latter class.

On Thursday evening, March 15th, a special meeting of the Branch was held at the Chase Auditorium, at which time Dr. Blum addressed a large gathering. The subject was "Electroplating Research at the Bureau of Standards" and proved of much interest to all present. At noon hour the same day, Dr. Blum addressed the members of The American Society of Mechanical Engineers at the Waterbury Club. W. F. GUILFOILE, *Sec'y.*

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ROCHESTER BRANCH

On March 16th the Rochester Branch held its regular monthly meeting. Due to some unavoidable difficulties Mr. G. P. Huntley of the Harshaw Chemical Co. was unable to be here and deliver his talk on Bright Cadmium Plating. However, through the efforts of Mr. Frank Kolb of Bausch & Lomb Optical Co., we were able to obtain as our speaker, Mr. T. J. Zak, an assistant to Mr. Kolb, who delivered an address on "The Spectrograph and its Industrial Applications", in which he described the Spectrograph, which is an instrument designed to break up light from a source into its constituent wave lengths and to provide a means of qualitative or quantitative study of the spectrum thus formed. Basically, a spectrograph consists of a slit, lens, the dispersing system and the observing or recording system. A brief description and the functions of each part of the spectrograph were then taken into consideration and the preparation of specimens, the actual photographing and the interpretations of the spectral were briefly discussed. The extreme sensitiveness, speed of analysis and positive identification were points which Mr. Zak stressed. Finally, Mr. Zak described several industrial applications where the Spectrograph has proven itself to be a useful and indispensible tool to the industrial and research chemist. Mr. Zak's talk was listened to with great interest and at its conclusion he was given a rising vote of thanks. A brief business meeting was held before Mr. Zak's address, during which it was decided to hold a bowling party in the very near future and the following committee was appointed to arrange the party. Mr. Hart, chairman, Mr. Lux, and Mr. Glitzer. The meeting was then adjourned.

JUDSON R. ELSTER, *Secretary.*

APPLICATIONS

Gilbert Holmgren, 1522 W. Austin Ave., Chicago, Ill.	Chicago
R. D. Alsdorf, 3816 W. Euclid Ave., Detroit, Mich. (Assoc.)	Detroit
A. E. Greise, 5712 - 12th St., Detroit, Mich. (Assoc.)	Detroit
Ed. S. Witthoff, 1116 Lakewood Ave., Detroit, Mich. (Assoc.)	Detroit

ELECTIONS

Gilbert Holmgren, 1522 W. Austin Ave., Chicago, Ill.	Chicago
R. D. Alsdorf, 3816 W. Euclid Ave., Detroit, Mich (Assoc.)	Detroit
A. E. Greise, 5712 - 12th St., Detroit, Mich. (Assoc.)	Detroit
Ed. S. Witthoff, 1116 Lakewood Avenue, Detroit, Mich. (Assoc.)	Detroit

REINSTATEMENTS

Chas. Cunningham, 7347 Pinehurst Ave., Dearborn, Mich.	Detroit

TRANSFER

J. A. Lupien, 3220 Bellevue Avenue, Detroit, Michigan. (Transferred from the Los Angeles Branch, active)	Detroit

RESIGNATIONS

Frank B. Lyman, Chas. Dunavan, Eugene Ernst, all of Rochester Branch.

SUSPENSIONS

Los Angeles Branch — H. A. Brannon, B. C. Gardes, E. D. Bedwell, J. C. McCandless, E. C. Pifer, Frank Shaw and Wm. Shuler.